SCIENTIFIC AMERICAN

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THE MANUFACTURE OF PHOTOGRAPHIC APPARATUS.

Among all the pleasures enjoyed by old or young, we know of none more rational and elevating than that of photography. It inevitably cultivates the love of nature, elevates the standard of taste, beautifies the home, gives pleasure to one's friends; it brings to those who practice it new associations, and tends to break up the monotony of life and fill in the hours which, in all probability, would otherwise be wasted.

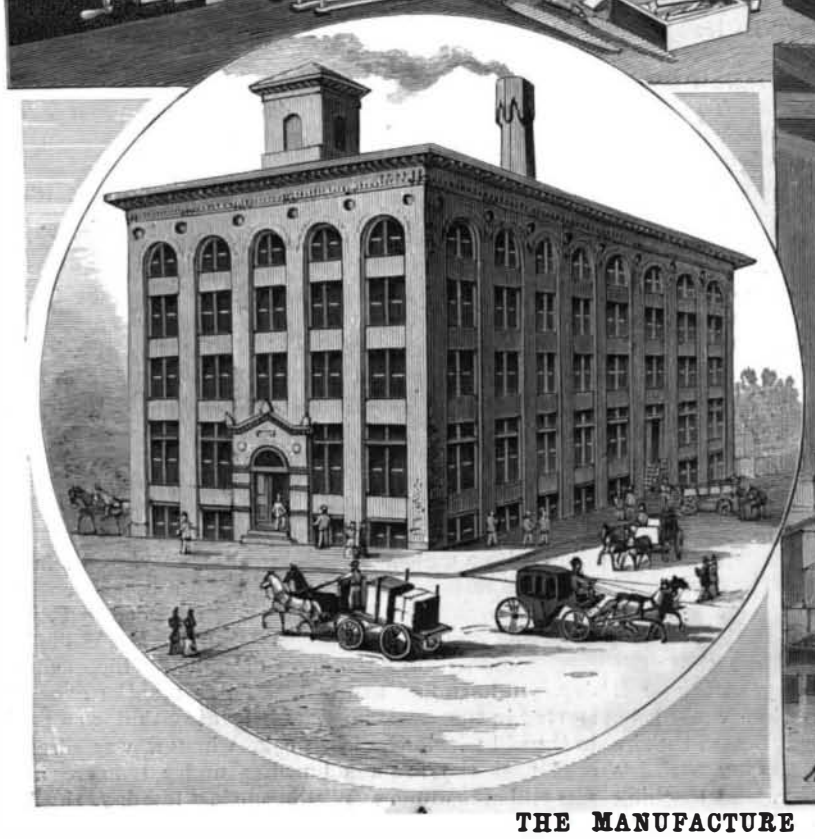
Photography is a grand science, of great value to the world as practiced by professionals, and it now has relations to very many of the arts and sciences. Its present and prospective capabilities will never cease to be a wonder to us. The popularization of photography and its extended practice by amateurs has, therefore, in a natural way, given rise to a number of industries of no inconsiderable importance and of large account in the aggregate. One of these industries forms the subject of the accompanying illustrations. They represent an establishment where are made cameras of every grade and size, from the first-class instruments used by professionals and many amateurs down to the simplest outfit. It would require a volume to adequately describe all the details of the business, running as they do into many quite distinct specialties, but we will note a few of the leading features.

The business requires the entire room of a factory structure 60 by 124 feet on the ground and five stories high, with a separate boiler house, in which are placed the boilers, having the latest improved Hawley down-draught furnace. The machinery of the works is driven by a 120 horse power Corliss engine, and every improvement that modern invention has developed in machinery for working wood and metals has been adopted, not only as an economic measure, but also to insure work of the best style and finish. The building, as will be seen by the illustration, is a modern, substantial factory building, with ample light and excellent ventilation; in fact, it is a model building for manufacturing purposes, in the construction of which the comfort and convenience of the workmen have been considered.

In Fig. 2 is shown an interior view of the woodworking shop, in which are made the cases and all the varied styles of woodwork required in the more or less expensive instruments. Perhaps it will not be necessary to go into the details of all the machinery used by this department, as, with the exception of a few special tools, it is much the same as that found in first-class cabinet factories.

The metal-working shop, which forms the subject of Fig. 3, is the department from which is turned out all the carefully made and well finished metal parts which are so noticeable a feature of optical instruments. Many of these metal parts being of peculiar form require special tools, which have been devised for this particular use. The

(Continued on page 37.)



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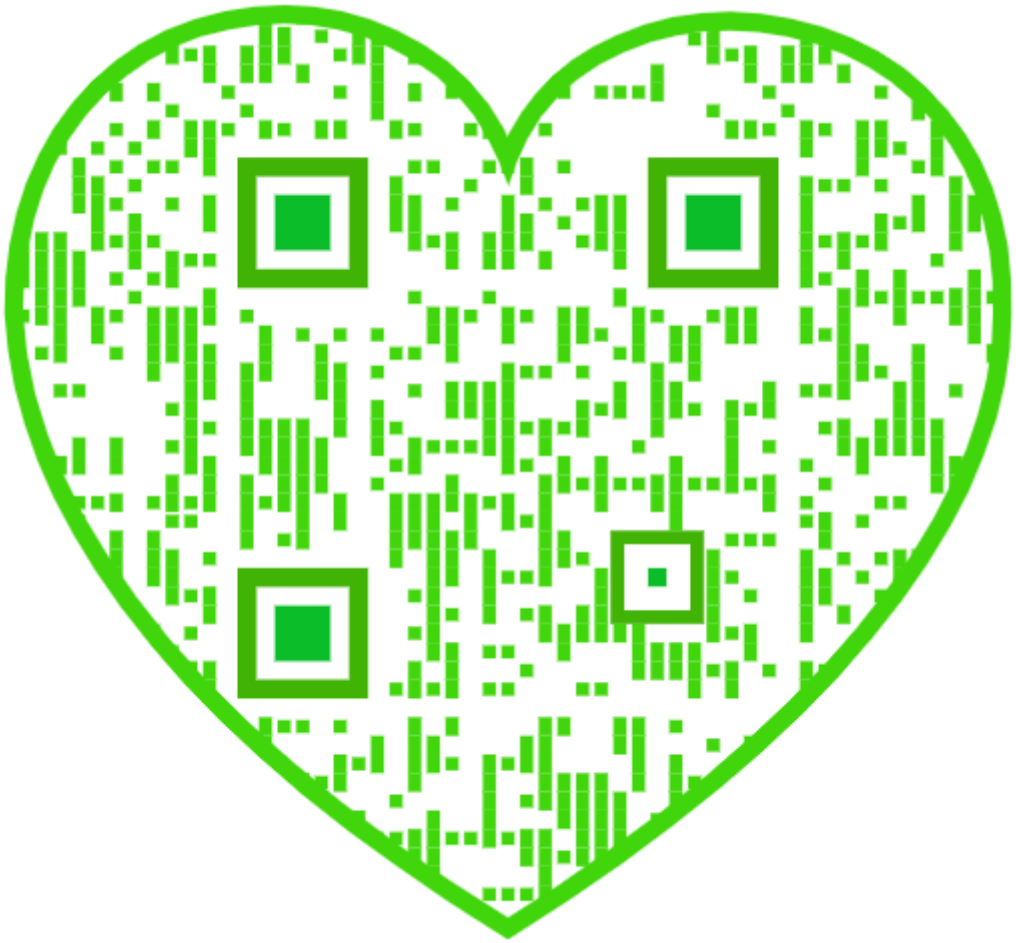

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Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural implement tests..... 34
Agricultural machine seat, Beyer's*..... 38
Arawaks, the aboriginal..... 43
Automobile carriages*..... 40
Bicycle and horse..... 43
Bicycle notes..... 35
Bicycles, every one investing in. 34
Boiler scale prevention..... 42
Books and publications, new..... 45
Brake, vehicle, Chamberlin's*.... 36
Butter, improving flavor of..... 42
Cameras, manufacture of*.....36, 37
Canal, the North Sea*..... 41
Carriages, road motor*..... 40
Cats and cold storage..... 39
Chemical terminations..... 42
Cigar case borer, the*..... 40
Crimping tool, Wood's*..... 36
Decimal system, the..... 42
Drops, the size of..... 42
Earth currents and volcanic action..... 35
Economics, problems in..... 34
Electrical railway conduits, New York*..... 38
Electric fans cause fire..... 39
Electric light plant, a steamer*... 39
Electric system, the Niagara..... 41
Force and energy..... 42
Greek language, the..... 36
Horse and bicycle..... 43
Hydrogen peroxide a preservative..... 36
Inventions, recently patented..... 44
Irone, extract of orris root..... 39
Life guard for cars, Beebe's*..... 36
Machinery as an educator..... 38
Metal workers of Asia..... 38
Muck land on fire..... 34
Naval notes..... 43
Neumann, Professor Franz..... 35
Notes and queries..... 45
Optical Company, the Rochester*. 33
Patents, English..... 36
Patents granted, weekly record.. 45
Photographic apparatus, mfe*..33, 37
Photographs, gold lacquer..... 41
Pneumatic tires, protection of... 41
Poultry cars..... 39
Steamer Bay State*..... 39
Shipbuilding for the year..... 41
Study, summer, for city children. 34
Tannin from palmetto leaves..... 42
Telephony, Reis' place in..... 35
Timber, Washington..... 44
Trades, influence of, on faces..... 42
Trout, musky..... 39
Volcanic action and earth currents..... 35
Wheelmen, American League of. 35
Window shade, Eckert's*..... 36
Wool cleaning with naphtha..... 44

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 1020.

For the Week Ending July 20, 1895.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ARCHÆOLOGY.—Recent Excavations at the Pyramids of Dahshur.—Details of important archæological discoveries..... 16306
The Roman Town at Silchester.—Describes the systematic excavations at Silchester, England, which have recently brought to light important remains..... 16308

II. ASTRONOMY.—Notes on the Progress of Astronomy During the Year 1894.—This article deals with the twenty-three planets newly discovered, five comets, with observations on the Solar Parallax, Mars, Jupiter, double stars, nebulæ, photometry, astronomical photography, new observatories, etc..... 16310

III. BIOGRAPHY.—Don Manuel Candamo.—President of the provisional government of Peru.—1 illustration..... 16305

IV. BOTANY.—Notes on Hardy Plants..... 16308
Hardy Border Plants.—With an important table of the most important border plants..... 16309

V. CHEMISTRY.—The Cause of Asphalt or Paraffin Base in Petroleum Oils.—An original communication.—By A. S. COOPER..... 16304
Citric Acid from Cane Sugar.—By Dr. T. L. PHIPSON..... 16304
Sulphur in Oil.—By WILLIAM FOX and D. G. RIDDICK.—The table gives the mean amount of sulphur in grains per gallon..... 16304

VI. CIVIL ENGINEERING.—A Line of Twenty-eight Inch Cast Iron Submerged Pipes Across the Willamette River at Portland, Oregon.—By FRANKLIN RIFFLE and ALBERT S. RIFFLE.—A continuation of this important paper, giving additional details of constructing the pipe line.—This installment includes abstracts from the discussion and correspondence.—9 illustrations..... 16296
Opening of the North Sea Canal.—A description of this important engineering work, which was opened June 20.—The article is accompanied by map of the canal.—6 illustrations..... 16296

VII. GEOLOGY.—The Appleton Cabinet, Amherst College.—A description of an important collection, a portion of which was obtained by the late President Hitchcock..... 16305
Recrudescence of the Activity of Vesuvius.—1 illustration..... 16310

VIII. MECHANICAL ENGINEERING.—Carl Hamann's Improved Gear for the Transmission of Great Power.—1 illustration..... 16300
The Ornamental Iron Industry.—The process of making twisted wrought iron stoves, leaves, drills, lamps, etc., are described and illustrated.—9 illustrations..... 16302

IX. MINING.—The Diamond Mine of Agua Suja, Brazil.—1 illustration..... 16306

X. MISCELLANEOUS.—Public Buildings in Brussels.—This article describes the Hotel de Ville, House of Corporations, Guild Houses, etc., on the Grande Place at Brussels.—4 illustrations..... 16306

XI. NUMISMATICS.—The Coinage of the Greeks.—By G. F. HILL, M.A.—An interesting general description of some of the more important coins of ancient Greece.—23 illustrations..... 16307

XII. PHARMACY.—Holigarna and its Blistering Principle.—By DAVID HOOPER, F.L.S., Quinologist to the government of Madras..... 16304

XIII. PHYSICS.—Porosity of Solid Bodies for the Light Ether..... 16304

XIV. PHONOGRAPHY.—The Long Gains of Shorthand.—By AMOS R. WELLS.—A resume of the advantages which attend the use of phonography..... 16305

XV. TECHNOLOGY.—The Textile Industry of Germany.—An important article describing the centers of German textile industries..... 16301
The Tin Plate Industry in the United States.—Another installment of this important paper on a representative industry.—The total annual consumption of tin plate in the United States is 6,000,000 boxes.—The American tin plate industry now menaces that of Great Britain..... 16300

PROBLEMS IN ECONOMICS.

We are apparently just emerging from a long financial depression, which has more or less affected every trade and profession, and the acknowledged universal condition of the well-to-do, not less than those in medium circumstances, is that of impecuniosity or an approach to it. For more than twelve months, or perhaps twice that length of time, the prevalent practice has been that of economy, the expenditure of a dollar has been preceded by all sorts of calculations as to how to retain it, and now when a great craze seizes the public we are confronted by a curious anomaly. Business men, clerks of both sexes, typewriters, and even servants are ready with their hundred dollars for investment in a wheel. Now this involves two problems, one of which is to discover by what argument the majority of the vast number of purchasers convince themselves that they require a wheel, and the other is by what process do many of them produce the amount of cash required for the purpose.

It may very readily be imagined that a number, but a small number, compared with the whole, want the machine for practical use, for it really accomplishes a saving in time, labor, and perhaps money. Some even may require it for physical exercise, but the vast majority purchase it as an instrument of sport or pleasure.

Having decided, with or without reason, to own a wheel, there seems to be no lack of ready cash for the purpose. Now a hundred dollars is no inconsiderable sum for the majority of such as buy wheels to expend on a thing of that kind. If the amount were required to pay a doctor's bill, it would not be so readily forthcoming. If, for prudential reasons, it should be buried in the vaults of the savings bank, it would be deposited only with the feeling of suffering a present inconvenience for a future convenience; but when it goes for a bicycle it goes easy.

If the amount cannot be commanded in a lump, it can be raised in installments, and so the hundred dollars is got rid of, but it is a hundred dollars all the same.

We are the last to find fault with this particular craze, and we do not advise against the expenditure of money for the purpose, but there seems to be a lesson to be learned from all this, which may be beneficial.

In purchasing a bicycle, have not thousands learned that, in order to secure the money, they were obliged to economize in one way or another, and in so economizing have they not found that they had been indulging in many expenditures that might have been avoided? Have they not found it easier to save a hundred dollars than they thought, before they felt they must do it for the indispensable wheel?

SUMMER STUDY FOR CITY CHILDREN.

In this hurrying last decade of the century, when everybody is "trying to get time," the problem of where the young may get it has been partly solved by shortening the hours spent in the school room. The daily session closes in popular city schools at one o'clock. Thus time is found for riding and dancing lessons; for fairs, parties and the theater; for ball games and gymnasium practice; for private theatricals, candy pulls and the other amusements which somewhat relieve the monotony of school life.

In private schools, the year begins late in September, or, as in New York, the first or second week of October, and closes early in June. The summer vacation is, therefore, from three to four months long. During nearly all of this time, a considerable number of families are settled in the country to lead fairly regular lives.

It is thus that the children can best recruit for another winter of study and amusement. To parents who make this rational provision for their children, and who have thus, also, time for reflection, must sometimes come the questions: "When are my children to get an education?" "Is the best preparation for study in the winter, total suspension of directed mental activity in the summer?" "Is it wise to allow the vacation to be spent in carrying out programmes for each day in the week of diversions such as tennis, driving, dancing, rowing, sailing, wheeling, riding, shooting?"

Would not all this exercise be just as beneficial and enjoyed with even more zest if say two morning hours, five days in the week, were devoted to regular study?

It is for boys and girls who have no taste for books, who never turn to one for companionship, that regular mental work is most desirable.

How necessary for usefulness in life is the equipment of a well disciplined mind.

Summer study can easily be adapted to the needs of the pupil, and the proper teacher will see that it is made attractive. If, during the school year, the pupil has from any cause lost progress, the time cannot be so well spent as in making good these losses, so that he may start in the autumn on an equal footing with his classmates. If, from lack of capacity, poor teaching or overcrowding in classes, there are subjects in mathematics, where they are most likely to be found, in grammar or any other study which have not been understood, this is an opportunity to review them and have the rough places made smooth.

A good beginning in a language may be made in a summer; or the foundations having been previously laid, a book of Cæsar or Virgil may be read, or two or three plays of Schiller or Moliere.

But for the study of science it is the very best time of year, and offers in every respect the best conditions ever to be had by pupils who live in the city. Many a stone wall is not only picturesque, but the burial place of fossils which are a clew to the geologic history of the ground whence they were gathered. What a pity not to learn it, when one may so easily! Even to children under twelve, elementary lessons in botany and zoology may be made delightful.

Tracing the life of a dandelion from its early leaves to its winged seeds, and learning the oyster's place in the animal kingdom and the delicacy of its organs, amounts to discovering two new worlds to a child who has never known what the dissecting knife and the microscope may reveal.

The fact is that Earth's everyday wonders are as if they were not to thousands of grown people for lack of early eye opening. The actual knowledge to be gained in a summer of the classification and peculiarities of plants and animals is not half so valuable as are the incidental lessons in observation sure to be gained.

Tests of Agricultural Implements.

Bulletins No. 4 and No. 7 of the Utah Experiment Station contain interesting results from tests of draught of farm wagons, plows, mowing machines and harrows, as measured by a self-recording dynamometer.

The conclusions as stated in these bulletins are as follows:

That colters add to draught of plows by some 15 per cent. That trucks or wheels under the end of the plow beam decrease draught by about 14 per cent, add uniformity to the furrow and lessen the work of the plowman.

When the traces are not in line with the draught of the plow the draught is increased.

Lenthening the hitch slightly decreased the draught. A share badly sharpened increased the draught 36 per cent over a new share. A dull share drew harder than a sharp one, but not as hard as a badly sharpened share. Draught decreases with the depth and with the width per square inch of soil.

Walking plows gave slightly less draught than sulky plows with rider. Sulky plows drew easier down hill, but much harder up hill than walking plows. A share straight on its land side and bottom took land well and gave a slight decrease of draught. A loss of draught was found on a sulky plow when its adjustment to take land was made from the pole.

A wagon with fellies 1¼ inches wide drew on moist, but close, blue grass sward 41·6 per cent harder than wheels with fellies 3 inches wide. On a dirt road, slightly moist, the narrow tires drew 12·7 per cent heavier than the wide tires.

Draught on plank road is one-fiftieth of the load, and not one-seventh of the draught on a dirt road in its ordinary condition after a rain.

A load over the hind wheels drew 10 per cent easier than over the front wheels.

Lowering the reach, or the coupling pole, on the hind wheels decreased draught; wagons draw easier when the traction has an upward incline, and harder when horses are hitched to the end of the pole.

Loose burrs reduced draught 4·5 per cent.

An old mowing machine repaired drew easier than a new one.

The draught was 8·7 per cent greater for a well sharpened sickle than for one more nicely sharpened.

A pitman box set tight gave less draught than one set quite loosely.

When cutter bar is not near right line with pitman rod the draught is increased.

When guards are out of line the draught is increased.

When cutter bar inclines upward draught is decreased.

When the sections of the sickle do not strike in the center of the guards the draught is increased.

The draught was decreased ten pounds by the driver walking.

A loss of force was observed when the wheel at the end of cutter bar failed to work well.

Muck Land on Fire.

For three months a Blackford County, Ind., farm has been burning underground, and it has been impossible to extinguish it. The farm is owned by Frank Williams, auditor of Wabash County. Mr. Williams' farm contains sixty-six acres of muck, which, when dry, will burn like sawdust. Three months ago fire started in the muck land. Little attention was paid to it until within the last week, when it was discovered that the fire was burning under ten acres and was still spreading. Within the last few days the ten acre patch has been a glowing furnace.

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Reis's Place in Telephony.

BY A. E. DOLBEAR.

In the German exhibit at the world's Fair at Chicago was displayed a bust of Phillipp Reis, of Friederichsdorf, Germany, and it was labeled with a card stating that he was the inventor of the electric speaking telephone. A monument built by the German people in his memory bears the same statement as an inscription. Reis's work on the telephone was all done between 1860 and 1863, yet in this country we have heard of him chiefly for what it has been alleged he did not do. Within a year or two it has been written in good English by persons who certainly ought to know, that Reis's telephone was only a tone telephone which would reproduce sounds of various sorts but not speech, and this in spite of the fact that Reis said emphatically in one of his lectures that "words even were reproduced" by his apparatus, and in spite of the explicit testimony of a good number of persons yet living who were witnesses of his work in his own hands that they heard it transmit speech, such for instance as Prof. Quincke, of Heidelberg, Dr. Messel, of London, Dr. Hagen, of Cambridge, Mass., now deceased. The question is not as to whether the speech was transmitted well or ill, but was it transmitted at all. If it was transmitted at all, then he was the inventor of the telephone. Improvements might come, but the apparatus to be improved was already invented. Henceforth it was simply a question of relative efficiency.

After improvements in both transmitter and receiver had been made and the telephone became of commercial importance, the owners of the improvements saw that to hold a monopoly on the business it was needful to show that Reis did not invent a speaking telephone, and to accomplish this, technical advantage was taken of every available thing. Reis's description of his apparatus was strained beyond measure, his plain statements were ignored, the direct testimony of eye and ear witnesses was not allowed to be heard, and as Reis himself was dead, he could not be heard. Worse than that, inventors were allowed to patent apparatus which embodied what Reis showed in his, without any improvement, if the description of it and its mode of operation was different from Reis's. As proof of this, compare the apparatus described in the famous Berliner patent about which there is now so much concern —a patent which was applied for in 1877, and issued in 1891. There is not an essential thing in that which was not shown in Reis's devices, and for the purposes of speech transmission the latter will work as well as the former; but they are described in terms which will apply equally well to Reis. Now a change in description of a piece of apparatus does not make a change in its mode of operation. The latter is automatic. That which makes the transmitter of to-day better than the Reis transmitter is the substitution of hard carbon, and nothing else, in the same place and for the same purpose for platinum which was used by Reis. If Reis had chanced to employ such carbon in the place of platinum, he would have had a good speaking telephone, and he might have described its mode of operation just as he did describe his platinum-tipped electrodes.

The whole stress of the controversy was not upon the apparatus and its necessary automatic action, but upon Reis's description of its mode of operation, and so successful was this attempt that one judge declared that "a century of Reis would not make a speaking telephone." This can only refer to the description, not to the apparatus, for, as I have said above, the substitution of a bit of hard carbon for the platinum terminal would have made a perfect transmitter.

Who made that substitution? Neither Bell, nor Blake, nor Berliner, nor Edison, but Hughes, of London, and he gave it to the world. Like many another testamentary gift, the legatee failed to receive the legacy through crafty legality.

Again, in 1866, Mr. Yates, of Dublin University, while experimenting with Reis apparatus, placed a drop of water between the terminals of the transmitter, for the express purpose of preventing the abrupt breaks in the current, and succeeded in transmitting speech perfectly, as one can see would be the case. There were several witnesses of this living when the telephone cases were being heard here and abroad, but their testimony was excluded. Nothing would answer but the printed page, printed at the time; and as it happened the experiment was not described, only remembered, it followed that what was good enough for true history was not good enough for law.

Once more. Emphasis has been put upon the statement that the inefficiency of the Reis transmitter is due to its breaking the current at every vibration, so it can only transmit pitch and not speech, whereas it is easy to show it is nothing of the sort; and that when the transmitter is spoken to gently it transmits fairly well, in spite of the breaks which may occur. Sudden breaks in the current make so strong a sound in the receiver of any type as to persist in the ear for an interval long enough to drown weaker sounds if they be present. If the Reis transmitter be provided with a shunt circuit, so there will be a current in the receiver all the time, whether the movable terminals be in contact or not, one may discover at once whether the apparatus works the way it has been alleged to work and as the courts have decided it does work. One may hear and understand nearly everything said, and this proves that the Reis transmitter has the proper microphonic action. This does not make it a commercial instrument, but it serves to show that all the arguments made against it were wrong and were based upon untrue assumptions.

Many substances have been tried in the endeavor to find a substitute for hard carbon. None have been found its equal for such a purpose, but the metal osmium works fairly well, while silicon and boron, the chemical relatives of carbon, can also be used.

Some day the whole story of the telephone will be written. Distinctions will be made where they exist and where they do not exist; identity will be noted. It is now very certain that then there will be no need to change the inscription upon Reis's monument.—The Electrical Engineer.

Professor Franz Neumann.

Professor Neumann, the eminent physicist and mathematician, died on May 23 at Königsberg at the age of ninety-seven. At a recent meeting of the Paris Academy the secretary, M. Bertrand, in announcing the loss the academy had sustained by the death of such a distinguished correspondent in the geometry section, pronounced the following short éloge on Professor Neumann's contributions to knowledge:

"Franz Neumann, professor of physics and mineralogy at the University of Konigsberg, made his début in science more than seventy years ago by some beautiful works on mineralogy. Soon after he directed his studies toward physics, and by an admirable 'Mémoire sur la Théorie des Ondulations,' which was presented to the Berlin Academy in 1835, he took his place among the masters of science. Neumann, like Cauchy, but by very different means, was led to consider luminous vibrations as taking place in the plane of polarization, while Fresnel thought them perpendicular; he knew how to follow in the most minute details, always in accordance with the observation, the mathematical consequences of his hypothesis. But Fresnel's theory is not contradicted by any of the experiments; so doubt continues, and the ever renewed discussions, whatever their conclusion may be, will remain a noble homage to the man of science and profound physicist who was the first to start them.

"Neumann's memoir on induction showed again the great mathematical skill of its author. In it Neumann translated by general formulæ the discoveries of Faraday and Lenz's laws; it is to him that we owe the expression of the potential of a system of two closed currents of which merely the existence, independently of the very elegant form which he has given it, has played such a great part in science.

"Franz Neumann was a great professor. Even at the age of ninety he attracted numerous auditors; his lessons, received and written out by learned students, have been studied in all the universities of Europe. The study of physics was his aim; but when he came across a fine mathematical problem he excelled in interesting his auditors by initiating them occasionally into the highest theories of analysis. It is with justice that in 1863 the section of geometry, making amends for a long neglect, elected this illustrious physicist into the Academy."

The Effect of Volcanic Action Upon Earth Currents.

Signor L. Palmieri, of the Vesuvius Observatory, has taken observations during the past six years upon the action of earth currents on a telegraph line extending between the observatory and Resina. He has found that when Vesuvius is inactive or during periods of minimum activity, the earth currents flow upward, irrespective of the azimuth at which the wire is placed, increasing and diminishing inversely as the activity of the volcano. When this activity reaches a certain point the currents cease, and if the volcanic action still further increases, the earth currents begin flowing downward, increasing with the activity of the crater. The experimenter, therefore, concludes that in the case of wires inclined to the horizon and out of the reach of volcanic interference the earth currents flow upward in whatever azimuth the wires are placed.

The National Meet of the League of American Wheelmen.

The National Meet of the League of American Wheelmen was held this year at Asbury Park, N. J., where the visiting wheelmen, who numbered thousands of ladies and gentlemen, enjoyed the bracing sea air and ocean bathing. The place is admirably adapted for a bicycle meet, as the roads are superb and large hotels numerous. Almost every club throughout the country seems to have sent representatives. The Denver wheelmen, seventy-eight strong, attracted much attention, and were pronounced the best dressed men at the meet, and, for numbers and appearance, the delegation from Colorado took the prize at the great parade which occurred July 9.

Bicycle Notes.

The doorkeeper of the Belgian Chamber of Deputies has provided a rack on which members can dispose their wheels upon arrival, for a large number of them have now adopted the practice of taking a morning spin before the opening of the session and arrive at the Legislative Palace mounted.

An efficient electric bicycle lamp has been devised at last. The electrical part of the lamp is a dry battery composed in some cases of three shells one-half inch in diameter and four inches long and in others of six of these shells. A continuous light is furnished for one hundred and forty-four hours without recharging. The current is regulated by means of a switch; the lamp can be recharged at a cost of twenty-five cents by purchasing of local agents one more of these shells, just as a man buys cartridges for a gun. The advantages of the lamp are that the vibration does not affect the light at all and there is no smoke, no leakage and no odor about it and it is far more reliable than the ordinary bicycle lamp.

Private Arthur E. Weed, of Company F, Ninth Infantry, left New York on a bicycle at 3 P. M., June 25, 1895, with a message to Col. Kline, at Madison Barracks, reached Sackett's Harbor at 20 minutes to 4 June 29. Starting on June 9, Lieut. Wise and Private Weed made the trip from Madison Barracks to Governor's Island in eighty-eight hours. The return trip made by Weed alone was made in ninety-six hours and forty minutes. The distance is 397 miles. Weed rode a twenty-one pound wheel and carried the regulation soldier's equipment, which weighs thirty-five pounds. Sackett's Harbor, where Madison Barracks are located, is 10 miles west of Watertown, N. Y.

The Customs Department of Canada has decided that tourists' bicycles may be admitted free of duty on affidavit that the machines are the rider's personal property, and not brought into Canada for the purpose of sale.

The injustice of requiring cyclists to carry lamps at night while other vehicles are not required to do so has been recognized in New York City. Mayor Strong has signed the Vehicle Light Bill. All passenger cabs, hacks and buggies will now have to have a lighted lamp at night the same as a bicycle.

An interesting test case came to an issue in Chicago July 1, when Judge Payne denied the bill for an injunction restraining the owners of the Fort Dearborn office building from interfering with a tenant while taking his bicycle to his office on the twelfth floor of the building. The judge, who is himself a wheelman, held that the bicycle was a vehicle not different from a horse and buggy as far as the right to exclude from the premises was concerned, and that the owners of the building have a right to make regulations regarding the admission of vehicles.

Perley Burritt arrived in Chicago at 12:45 o'clock, June 28, completing a ride on an eighteen pound bicycle from Jacksonville, Fla., to Chicago. The total distance covered was 1,385 miles. Burritt started on his ride on June 13, at 6.20 A. M. Burritt says that the ride was undertaken for pleasure. When he started on his ride he weighed 100 pounds. He gained twelve pounds on the trip. He carried baggage weighing twenty-five pounds strapped on his back.

A coupler by which two bicycles can be attached side by side is being introduced in New York City.

A dispatch from Waltham, July 1, states that Arthur W. Porter, of Waltham, the crack cyclist, did a mile in the face of a strong wind in 1:51 4-5.

Well authenticated stories about the scattering of tacks for the evident purpose of puncturing tires come from various places. It caused havoc at Sag Harbor, Sunday, June 23, where some person strewed tacks over the road with a liberal hand. Of fifteen wheelmen who reached the hotel at Sag Harbor, every one had a puncture and some had three or four. This form of malicious mischief should be severely punished.

The sum of 100,000 marks was included in the German Army estimates, the present year, for the supply of bicycles to the army. Two wheels are assigned to each battalion. The bicycles are to relieve the cavalry of a great part of its intelligence duty and to take the place of mounted orderlies. An Austrian officer has recently invented a military bicycle with which a very high speed has been obtained. The peculiarity of this bicycle is that the saddle is placed very low. The Russian, Portuguese and Belgian armies have now adopted the bicycle, regular instruction, practice and drill being provided for.

Military experts believe that there are few parts of any civilized country where a wheelman cannot in a day cover at least twice the distance possible to a horseman and in several consecutive days' riding the difference is still greater. The wheelman can go across country or over almost any line practicable for a mounted man and often where the latter could not go, though of course good roads are desirable for bicycles as well as for ammunition or baggage trains. The wheel can be easily lifted over stone walls or high fences, and unless the ground has been too recently tilled or the grass is too high, most open country is found to be practicable for the expert army wheelman.

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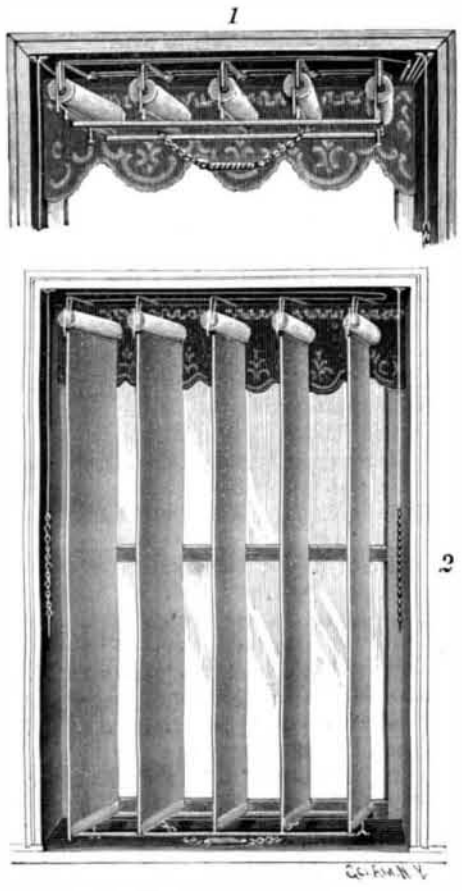
AN IMPROVED WINDOW SHADE.

The shade shown in the illustration consists of a series of sections, each capable of movement to or from an adjoining section, all of the sections being simultaneously adjusted in a simple and easy manner. The improvement has been patented by Mr. Joseph Eckert, of No. 1127 Park Avenue, New York City. In

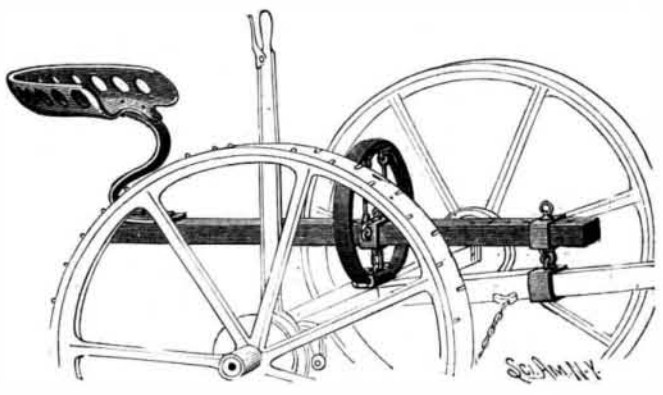


ECKERT'S WINDOW SHADE.

Fig. 1 all the shade sections are drawn up and stand at right angles to the window, and in Fig. 2 they are down and held at a slight inclination, to regulate the admission of light and air. Projecting from a rod journaled at the top of the window frame is a series of U-shaped guides, and in a socket in the window frame over each guide is journaled a hanger or bracket whose lower horizontal member carries a drum or hollow spring curtain roller, the tendency of the spring being to maintain the shade section rolled up, although the shade remains in such position as it is placed when pulled down. A cord at one side of the window is connected with the pawls of all the spring rollers, and by drawing upon the cord the various shade sections will be simultaneously raised by their several springs. Each hanger or bracket is held normally in a position to overlap the other by a spring coiled around its upper member in the socket, but in order that the shade sections may be carried to any desired angle, a bar pivotally connected with and extending across the upper horizontal members of the hangers is connected by a link with a cord extending over pulleys and down at one side of the window, the lower end of the cord having open links or loops for engagement with a button on the window frame. When this cord is left free the springs controlling the brackets cause the shade sections to overlap each other and stop the admission of light as would a one-piece shade. The bottom rails of the shade sections are connected together at their inner and outer ends by pivotally attached longitudinal bars.

A SWINGING SEAT FOR AGRICULTURAL IMPLEMENTS.

A seat in which the motion of the machine and the inequalities of the ground will be but little felt, the

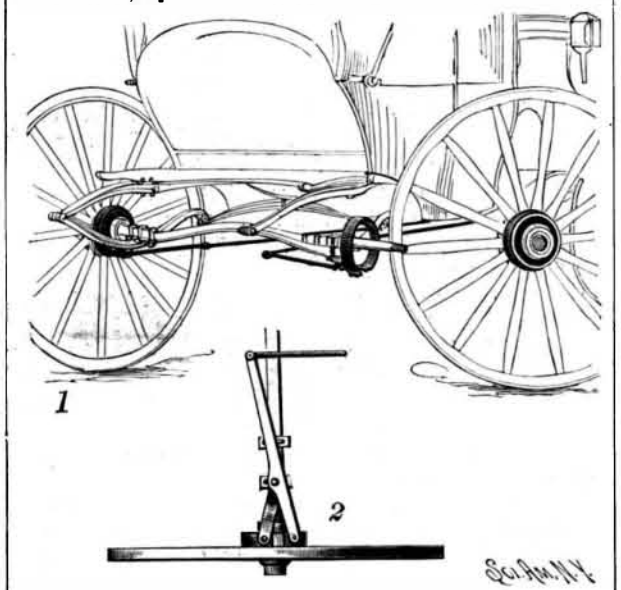


BEYER'S AGRICULTURAL MACHINE SEAT.

seat being also adjustable to suit riders of different weights, has been patented by Mr. Louis Beyer, Jr., of Calumet Harbor, Wis. Mounted on either the front or rear axle is a hoop or bow spring, through which passes a seat beam supporting the seat on a spring shank at its rear end, the forward end of the beam passing through a sleeve connected by a link to a sleeve on the tongue or on the reach. The upper sleeve has a set screw or pin to enter one of several holes in the seat beam, and the sleeves are adjusted backward or forward according to the weight carried in the seat. The seat beam is suspended in the hoop spring by links, whose upper ends have eyes secured to horizontal segmental meshing gears journaled in the upper portion of the hoop spring, one of the gears having a handle. By moving the gears to carry the upper ends of the links together to the center of the spring, which the rider may do without leaving his seat, a pendulum springing swing movement is obtained, designed to counteract any unevenness in hill work, the vertical position of the links being designed to afford ample elasticity in ordinary rough ground, retaining the seat essentially level and unaffected by the motion of the machine.

A CARRIAGE AND WAGON BRAKE.

A convenient and readily attachable brake device, which may be applied without interfering with any of the usual running gear, is represented in the accompanying illustration. It has been patented by Mr. Henry C. Chamberlin, of Lanesborough, Pa. Fig. 1 shows the application of the device on a carriage, Fig. 2 representing the connection of the brake band lever with a link whose other end is connected with a lever in reach of the driver. Attached to the wheel spokes by a clamping plate, and surrounding the vehicle hub, is a friction hub, with cylindrical flange to afford a friction bearing, and on the axle is clamped a bracket arm on which is pivoted a lever, to whose outer end is attached one end of a friction band, adapted to surround the friction hub, the other end of the band being affixed to the rear end of the bracket arm, which extends under the hub. It will be readily seen that the driver, by the movement of a hand or foot lever



CHAMBERLIN'S BRAKE.

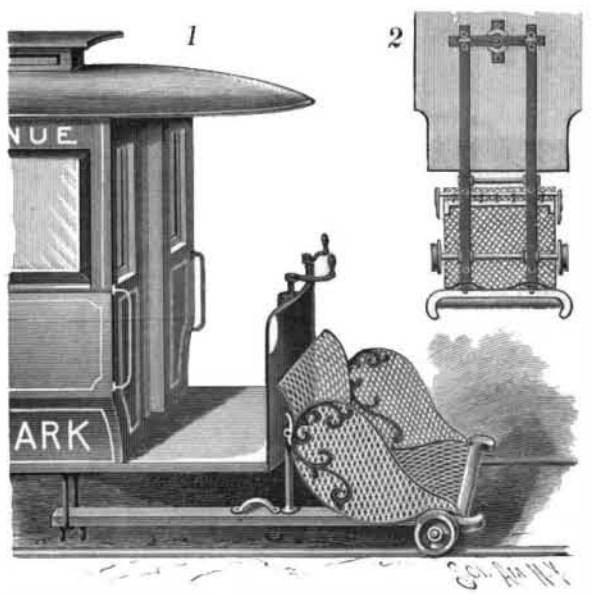
connected with the other end of the link which extends to the brake lever, will draw the friction band closely around the friction hub to retard or stop the wheel.

English Patents.

It appears from the twelfth report of the comptroller-general of patents, designs, and trade marks that last year 25,386 patents, 21,230 single designs, and 8,013 trade marks were applied for, the number of patent applications being the largest in the group, though this was not the case with regard to the other figures. Of the 25,000 odd patent applications, 500, or 2 per cent, were made by women, about 100 being inventions connected with articles of dress. The number of readers frequenting the Patent Office library showed an advance upon the previous year, 113,374 persons having availed themselves of its use.

AN AUTOMATIC LIFE GUARD FOR CARS.

This is a device designed to prevent the injury of any one, child or adult, who may be caught in the path of a moving car, by picking up and safely carrying the individual until the car is brought to a standstill, the body being so caught and held in an elastically suspended basket that contact with the drawhead, dashboard or wheels is impossible. The improvement has been patented by Miss Clara M. Beebe, of Elmira, N. Y. Connected by means of semi-elliptical springs, with arms which extend beneath the car, is a forward buffer having curved arms at its ends and a pneumatic cushion across the front, the device being shown applied to a car in Fig. 1, and Fig. 2 representing a bottom plan view. The arms extending beneath the car are braced by cross rods, one of which serves as an axle for front guide wheels, and on the rear ends of the arms are staples engaging loop-like hangers secured to a transverse swivel plate, which has a central bearing plate fastened between the car timbers, so that in rounding a curve the apparatus carried by the buffer arms has a free movement in front of the car. Uprights secured to the buffer arms in front of the dashboard carry a transverse rod from which is suspended, by means of springs, a cross bar to which is secured the frame of a wire basket having a curved or dishing bottom, and supported near its front edge by curved springs fastened to the buffer arms, the basket being thus yield-



BEEBE'S AUTOMATIC LIFE GUARD FOR CARS.

ingly supported at the back and at its lower front end. Handles on the buffer arms facilitate the shifting of the device from one end of the car to the other. In a patent which has been applied for, the inventor provides a further improvement designed to pick up a person prostrate on the track, without rolling the body along, the device being called into instant use by a touch of the motorman's foot, and as quickly withdrawn when no longer needed.

Hydrogen Peroxide as a Preservative.

According to Barbi (Pharm. Centralh., vol. xxxvi, p. 307), hydrogen peroxide is one of the best, least harmful and most convenient agents for preserving sirups, wine, beer, cider and vinegar. For this purpose 10 gm. (2½ fl. dr.) of the commercial peroxide of hydrogen may be added to each liter (say one quart) of the article to be preserved.

A HAND CRIMPING TOOL.

To quickly and firmly crimp a cap on an oil can or other receptacle, the simple hand tool shown in the engraving has been patented by Mr. John Wood, of Seventh Street and Jackson Avenue, Long Island City, N. Y. The tool is represented in use in one of the views, the other view showing the caps employed and a section of a can top with its cap crimped on. A flanged crimping disk is adjustably mounted to rotate loosely on the lower end of a stock in which is a pivot on which are fulcrumed two hand levers, the lower end of one lever carrying a crimping roll which rotates and slides loosely, and the other lever having a forked lower end adapting it to similarly carry two crimping rolls. Each crimping roll has an annular flange, and is held down by a coiled spring to press upon the annular flange of the crimping disk, the springs normally exerting a pressure on the lower ends of the levers to move their handles apart. When the cap is placed on top of the can and the tool applied, as shown in the illustration, the hand levers are in an outermost posi-

WOOD'S HAND CRIMPING TOOL.

tion and the crimping rolls do not touch the flange of the cap; but on pressing the handles together the crimping rolls move inwardly, and their flanges travel on the flanges of the crimping disk, causing the flange of the cap to turn in under the flaring mouth of the spout, the operator at the same time turning the tool to crimp the cap in place all around.

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THE MANUFACTURE OF PHOTOGRAPHIC APPARATUS.

(Continued from first page.)

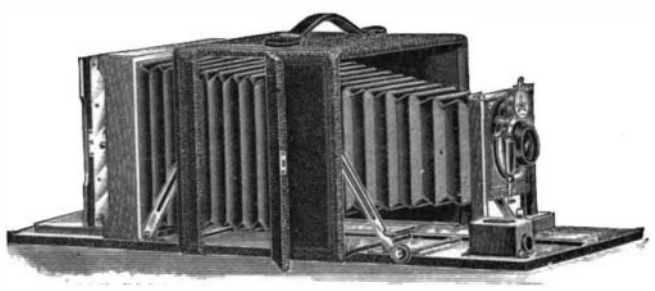
remaining illustration on our first page shows the hand camera department, in which are put together the various kinds of hand cameras for which this establishment is noted. We give illustrations of some of these hand cameras to show their convenient form when in use and their compactness when folded.

The Premo, shown in Fig. 5, is a complete and practical hand camera, having all the recent improvements, including the swing back and rising and falling front. It is arranged to receive a tripod on two of its sides. The view finder is attached to the bed, and is reversible. The ground glass screen has a new device, which prevents it from closing on the withdrawal of the plate holder, so that the latter may more readily be reinserted. A touch on the spring button closes the screen for focusing, and causes it to exert a pressure on the holder. Either glass plates or cut or roll films may be used in this camera.

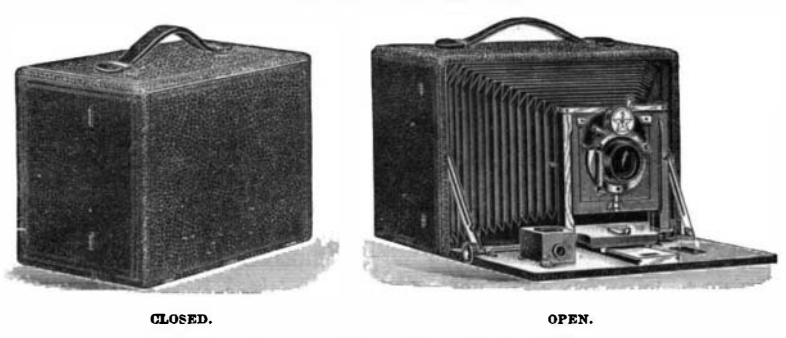
Fig. 5.—PREMO HAND CAMERA.

Fig. 6 represents the long focus Premo closed, opened as an ordinary folding camera, and also arranged for extremely long focus. This is a new device, which will be readily understood and appreciated by the photographer, who has often failed of securing possible results for the want of a few inches more of camera bellows.

We give in Fig. 7 an illustration of a Premo camera adapted for stereoscopic work. This camera is designed to keep pace with the reviving interest in stereoscopic views. The stereo lenses are matched and provided with a double shutter, designed especially for this use.



OPENED FOR VERY LONG FOCUS.



CLOSED. OPEN.

Fig. 6.—LONG FOCUS PREMO CAMERA.

In Fig. 8 we give an illustration of the Carlton twin lens camera. This instrument will be appreciated by those who desire to practice photography under the most favorable circumstances. It has two lenses of the same focus, one placed above the other, the lower one forming the picture on the plate, while the upper one forms an image on the ground glass at the top of the camera, the glass being of the same size as the plate. The ground glass screen is covered by a lid, which, when raised, forms a shield at the top and sides, which renders the image very distinct and clear. The lid has a mirror on the under side, which is used for viewing the image when the camera is reversed for vertical views.

The folding Premier, one of the standard instruments made in this establishment, is known the world over as a first-class practical camera. It has a fine lens and an efficient shutter. It is a favorite form of camera among amateurs.

In Fig. 9 we have shown some of the fine large cameras made at this factory. While these cuts give an idea of the shape and general appearance of these instruments, they do not convey a fair impression of the finish.

Fig. 7.—PREMO FOR STEREOSCOPIC WORK.

In Fig. 10 we have shown a view in the testing department, where every camera is subjected to severe tests, both as to its mechanical and optical parts

In Fig. 11 we give a view in the shipping department, which conveys an idea of the activity which here prevails. Besides the various kinds and sizes of cameras made at this factory, there are a number of excellent forms of tripod, adapted for the several forms of camera; also plate holders, printing frames, and a large number of accessories manufactured by them.

The Rochester Optical Co., of Rochester, N. Y., whose factory forms the subject of our sketches, was founded and is owned and managed by Mr. W. F. Carlton, who has shown great business enterprise and acumen in discerning prospectively the needs of both professional and amateur photographers, thereby gaining for himself a large and well deserved patronage.

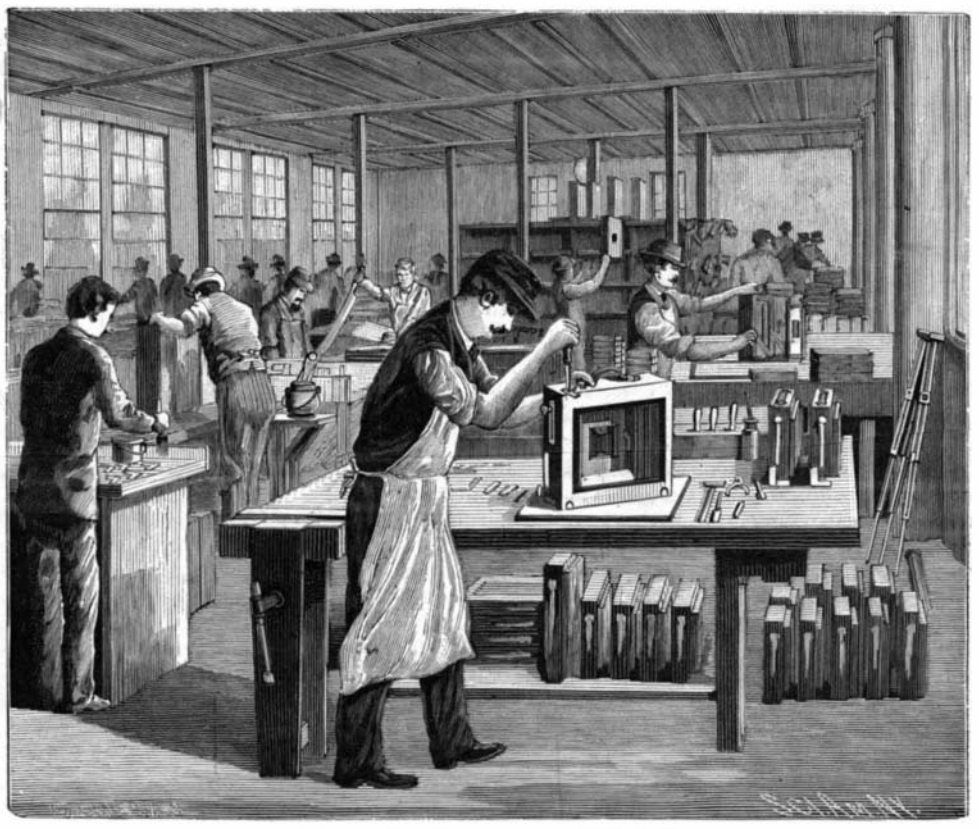


Fig. 9.—FINISHING LARGE CAMERAS.

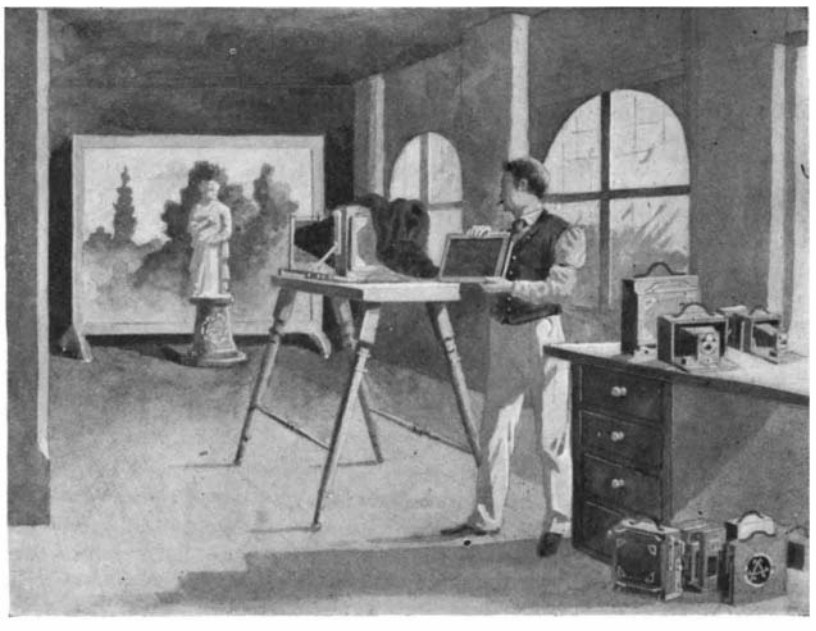


Fig. 10.—TESTING DEPARTMENT.

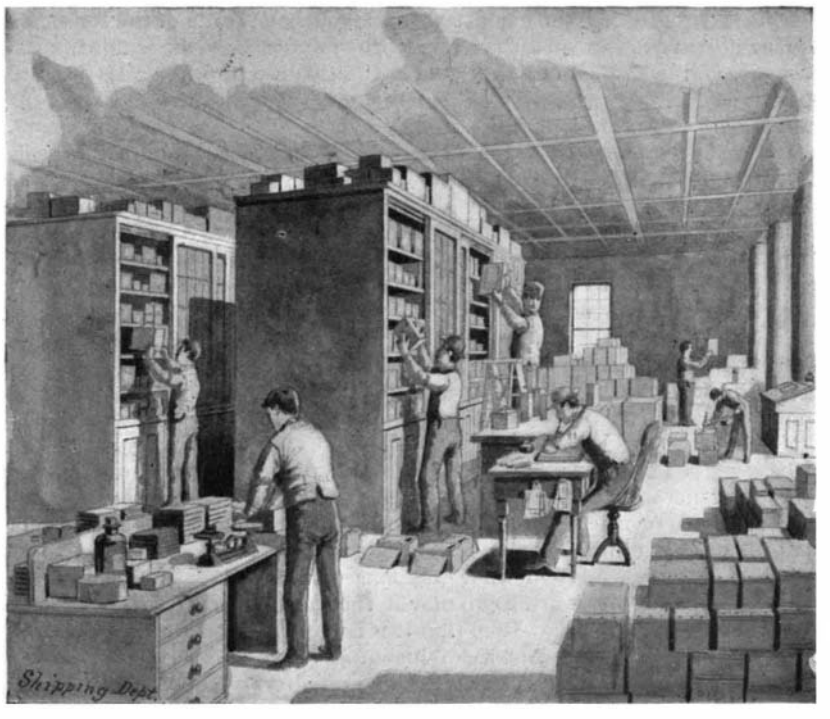


Fig. 11.—SHIPPING DEPARTMENT.

The Scientific American Cyclopedia of Receipts.

The Home Journal for July 3, 1895, says of the SCIENTIFIC AMERICAN Cyclopedia of Receipts, Notes and Queries: "After a use of several years, we can say that we know of no single volume which contains such a large body of practical information of value to the household in all its departments and to the amateur craftsman or mechanic. Not a single receipt has failed, nor is there an imaginable inquiry within the realm of domestic science or industry to which this book does not satisfactorily respond. It is a volume that will save its cost many fold, while to open and read it at random is to make an invariable and certain addition to one's knowledge."

Fig. 8.—CARLTON TWIN LENS CAMERA.

A SMALL electric lamp is being used instead of a bell in some telephone exchanges in England. The call for connection lights the lamp.

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Machinery as an Educator.

In looking at a complex piece of machinery, such as the great triple-expansion engines of a high-speed modern ocean racer, the first feeling of the uninstructed layman is apt to be that of confused awe. The huge mechanism appears to him as a leviathan, a great brute force, trained by man and under his control, but yet ready to strike down ruthlessly any one who shall get in its way. Education is about the last function that one feels ready to attribute to it. Yet in the Engineering Magazine, May, Alexander E. Outerbridge, Jr., tells us that a machine is a great educator, and he ranks its work in this line as of a very high grade. His ideas, which are worthy of careful attention, are given in the following extracts which the Literary Digest quotes from his article. The Literary Digest, by the way, is one of the most interesting weekly papers that comes to this office.)

"An impression prevails in the minds of many intelligent people, more especially, perhaps, among those who are not directly engaged in mechanical pursuits, that the tendency of modern methods of manufacture in the substitution of machinery for hand labor is detrimental to the intellectual development of the wage earner, in that it makes him an automaton, like the machine which he tends; that the workman in a great factory loses his individuality; that the handicraftsman of a former generation has disappeared, and that his successor is a mere marionette, to whom the gift of brains is a superfluity.

"It is the object of this paper to present briefly a different and, in some respects, a novel view of the educational influence that machinery exerts upon the mental and moral development of the workingman, and to show that the introduction of new inventions, so far from being an oppression to the wage earner, is, in fact, his greatest boon. These conclusions, which are the result of daily observation for a number of years in a large industrial works, are at variance with the opinions of those theorists and economic writers who maintain that mechanical occupation is necessarily narrowing to the intellect. . . .

"I am satisfied that an insensate machine, in the material combinations of which, however, the skilled designer 'has embodied his own mental faculties, so that it is constrained to do his will when power is applied,' performing accurately the most complex operations, exerts a stimulating educational influence upon the care-tender, even though he may be an illiterate man or boy entirely unconscious of this influence. If you give a boy of average capacity the simplest routine work to do in connection with a machine—it may be merely to feed it with raw material—he will, at first perhaps, perform his task in a perfunctory manner, taking little interest in the work and having no comprehension of the mechanism of the machine. Little by little, however, the constant repetition of mechanical movements, producing always one uniform result, impresses itself upon his latent powers of observation and comprehension, the underlying principles and heretofore hidden motive of the seemingly inexplicable combination of wheels and gears is revealed, and simple order is evolved out of complexity; a new interest is developed and the boy becomes an intelligent operator. . . .

"The educational influence of mechanical occupation upon the workingman is strikingly illustrated in another manner. You will find in all large industrial establishments employes who exhibit as much skill in their special work as that of well known original scientific investigators; they are daily performing operations as delicate in their way as the work of the microscopist, and with a degree of accuracy amazing to the novice. Take, for example, the simplest operation of calipering a tube or measuring a rod, and you will find mechanics dealing quantitatively with minute fractions of an inch which ordinary people totally disregard."

That all this close relationship between machine and operator has its educational value no one can doubt. But Mr. Outerbridge goes farther, and pursues his subject into a realm that harsh critics might be tempted to call that of fancy. A machine, he says, is in a certain sense the representative of the human mind that conceived it. He states this as follows:

"I believe that every novel machine possesses something of the personality of its creator. I believe, furthermore, that it is possible to trace through the machine, back to the inventor, a positive and continuing influence of his mind upon the mind of the operator.

"I believe that the special mental development of the present generation of American engineers and mechanics may also be traced through historical relics to the subtile quality of mind with which famous American inventors have endowed their creations. These forces have been silently working to mould the minds of men in characteristic grooves, so that it is as impossible to mistake a purely American machine for a foreign production as it is to mistake a Chinaman for an Indian. This characterization may be even more sharply defined. It is not an unusual observation among mechanical experts to-day that machines produced by one establishment may often be distinguished from similar machines of another make (without the aid of any name plate) through a peculiar 'something' which the Frenchman expresses with a shrug and 'Je ne sais quoi.'"

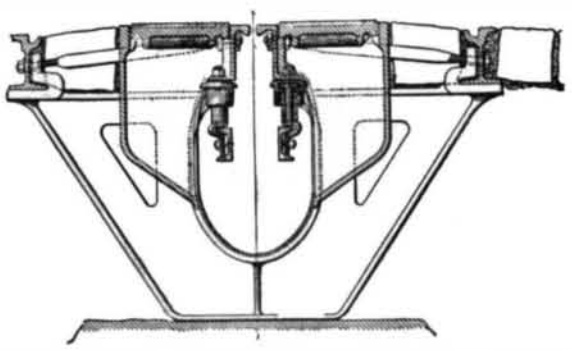
THE ELECTRICAL CONDUIT SYSTEM IN NEW YORK CITY.

In the city of New York some of the principal lines of street railway cars are at present operated by wire rope cables. This is an effective system when it is in good running order, but it is liable to breakage of wires, causing frequent interruptions, during which all the cars on a given section come to a standstill.

In the northerly section of the great city the overhead trolley has been introduced. But in the southern or more thickly populated portions, such trolley is considered undesirable, and a new electric line, in which the electric conductors are placed underground, has lately been inaugurated and the working proves to be highly successful.

The conductors are arranged within a slotted tube or conduit, which is located in the middle of the track. The appearance on the surface of the ground is similar to the cable system.

Projecting down from the floor of the car into the slot is a bar or plow which presses against the flat surfaces of two iron conductors running the entire length of the conduit. These conductors are placed each three inches on each side away from the center of the slot, to avoid deleterious effects of any drip which would otherwise reach them, and are of channel iron four inches deep and thirty feet long. They are suspended from the ceiling of the conduit by means of insulators devised for this especial purpose, and are at a depth of thirteen inches below the conduit slot.



NEW YORK ELECTRICAL UNDERGROUND CONDUIT SYSTEM—SECTION OF CONDUIT—INSULATOR SUSPENSION.

Each conductor is sufficiently rigid to require suspension at the ends and centers only, and the ends being located in the manholes, and handholes being placed at the centers, inspection and repairs are rendered comparatively easy. The conductors are bonded to each other by stranded copper wire securely riveted into the web of the metal.

The new line is constructed on Lenox Avenue, and extends from 108th Street to 146th Street, a distance of 2½ miles. The present power plant consists of two 650 horse power engines and 400 kilowatt generators. Steam is supplied from two Babcock & Wilcox water tube boilers arranged in one battery. Each has a rated capacity of 250 horse power, furnishing steam at 120 pounds. The engines are horizontal cross compound Allis-Corliss machines, which during the experimental trips are run non-condensing. All the steam piping is placed beneath the floor of the engine room. To each of the engines is coupled a General Electric 400 kilowatt generator of standard construction, but wound for 350 volts instead of 500 volts, as is the usual practice in railway work. The conduit was built along the grade of the street, but with sufficient pitch to permit any water flowing into the conduit to find its way into the manholes located every 30 feet, and from thence into the sewers.

The current does not return by means of the rails. Each conductor forms one side of the working circuit. The current merely rises on one side of the plow, passes through the controllers into the motors, and after performing its duty returns by the other side to the opposite or negative conductor.

The plow or traveling contact arrangement is also essentially novel. It consists of two pieces of iron, one on each side of the plow, supported on spring leaves which cause them to press outwardly against the two conductors. The plow is suspended from a longitudinal bar bolted to cross beams set upon the track, and is constructed of two sheets of steel laid each one upon a plate of fiber. The two sheets of fiber are then brought together, inclosing strip copper conductors connected at the top to the motor cables and at the bottom riveted to two other pieces of sheet steel. These run on each side of the plow and serve as supports for the hinges which carry the sliding contact pieces. A heavy sheet of fiber continues downward and serves to separate these contacts.

The motors employed are the standard General Electric 800 machines, handled by "K²" controllers. The cars which are used on the line were constructed by the John Stephenson Company, and are mounted on standard cable trucks constructed by the Peckham Motor Truck and Wheel Company. The cars are brilliantly illuminated at night by means of incandescent electric lights.

The Greek Language.

Dr. Achilles Rose, in a paper recently read before the New York County Medical Association, says:

"The study of the classics, especially the Greek, has been greatly favored in this country during the past years by the establishment of an American school at Athens. This school was founded in October, 1892, by the American Archæological Institute, and is supported by yearly contributions from eighteen universities in the United States. One result of the establishment of this school has been the gradual diffusion among cultivated people of a more correct notion of the Greek language, and of the appreciation of the fact that it is not a dead, but a living language, and that what is spoken to-day by seven millions is practically the same tongue that was used by Plato, Demosthenes and Plutarch.

"It is conceded that the study of the classical languages, and of the Greek more especially, cannot be dispensed with: it is the attribute of every cultured mind, the attribute of every true scholar; it is conceded that the classics are powerful means to elevate, to ennoble our mind, our character. Greek is and should remain on the school plan. Only another, a rational method of learning it, has to be adopted; it has to be learned practically, for practical purposes as well as for ideal. The most perfect, the ideal language will then speak for itself, and will inspire scholars to unite in agitation for its general adoption.

"Journals and new books are published regularly in Greece at the present day, and any one versed in ancient Greek need but to examine one of these publications fairly and without prejudice, to be convinced that their language is the same as that of the Anabasis or of the New Testament. There are differences, it is true, but they are merely in the way of simplification, such as every language—every living language, that is to say—undergoes in the course of time.

"The fact that the Greek language alone has preserved itself in all its original beauty through thousands of years is, to quote a modern Greek writer, 'Because the beautiful is like the sunshine upon this world—because the beautiful lives forever.'

"The Greeks of to-day speak a language which Pericles, Socrates and Phidias would undeniably have understood. An unbroken chain stretches from those times down to the present. The Greek language is indeed immortal.

"The pronunciation of Greek, as taught in our schools—which differs in a remarkable degree from that of the present inhabitants of Greece—lacks every scientific authority. The method of instruction in Greek in our schools and colleges is faulty.

"In order to have command of a language, it is, above all, necessary to know how the people speak; we must become familiar with the everyday language. Whoever is acquainted with the language of conversation of a people has the key to its literature as much as the natives themselves have.

"Greek taught like other living languages, by one or the other of modern methods, is not more difficult to learn than French or Spanish, certainly less difficult than German.

"Let us have a Greek school here in New York, with natives of Greece as teachers, with children of immigrated Greeks, with Greek as the language of the house, where our children can learn Greek just as they can learn French or German in French and in German schools in this our city."

Metal Workers of Asia.

Among the half civilized peoples of Central Asia are many artistic workers in metals. One of these nations or tribes, the Burates, is famous for inlaid work. The Russians call these workmen "Bratskaya Robata." They use gold, tin and silver for inlaid work on iron. The art has been practiced by them for thousands of years, and their skill has been recorded in the ancient folk songs of Asia. A writer describing their work says they hammer the silver, gold or tin very thin. Then the part of the object to be inlaid is made rough with a hammer, the surface of which is roughened like a file. Templets of birch bark serve to cut the metal into the proper shape, which is laid upon the heated object and lightly hammered into the rough surface, then heated to a blue color, and the inlaid metal is hammered smooth with a polished hammer.

The "Climax" Bicycle Watch and Holder.

In our illustrated notice, of May 18 last, of this device by Messrs. Ingersoll & Brother, 65 Cortlandt Street, New York, we omitted to state the price of the article, which is $2.50. This includes the timepiece. Every cyclist will appreciate the convenience of the article and its low cost.

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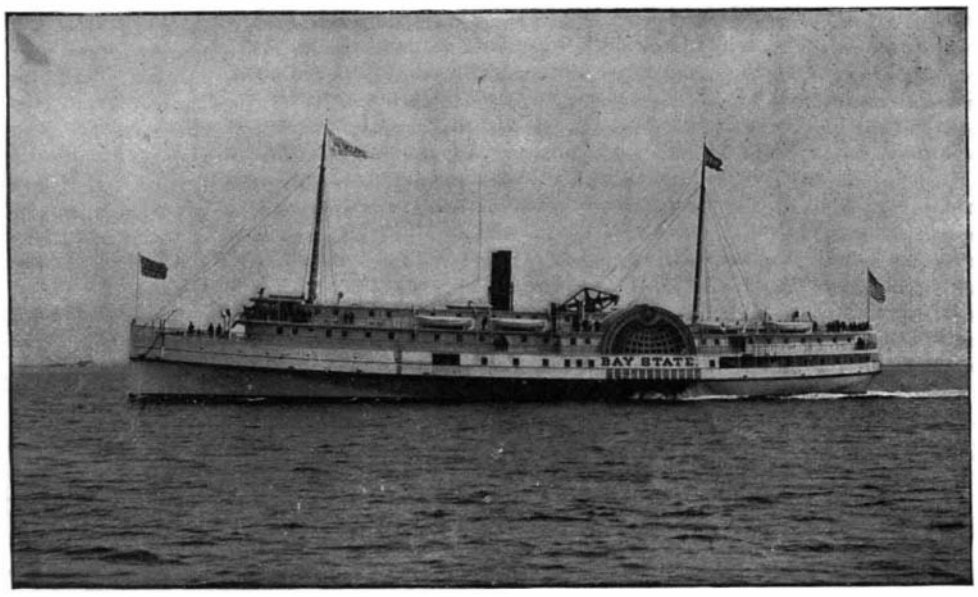
ELECTRIC LIGHT PLANT STEAMER BAY STATE.

The accompanying illustration represents the electric light plant on the new steamer Bay State, of the Boston and Portland Line, recently installed by the Belknap Motor Company, of Portland, Me. The engines used are the Ideal. The dynamos are multipolar slow-speed machines of 400 lights capacity each, but either machine will carry the entire load, amounting to 540 lights, it having become a general practice to use duplicate plants for marine work, so, in case an accident should happen to either engine or dynamo, the duplicate machine can do the work. The dynamos were designed by Mr. W. H. Chapman, electrician for the company. This plant does great credit to the company, and has secured further orders for the installation of two direct-coupled machines for steamer Portland, of the same line; also, for steamship St. Croix, of the International Steamship Company, which is practically under the same board of management. The system of wiring is most excellent. There are eight main circuits controlled at the switchboard in dynamo room, which lead to sixteen different distributing boxes, containing switches located in different parts of the boat, each switch controlling six lights, turning them on or off as may be desired. These distributing boxes have glass fronts, secured with lock and key, and are under control of the steward of the boat. Then there are pilot lights on main and fore rigging, and at the bows of the boat. The fixtures are of the latest design, with opalescent globes and shades. The dining saloon is fitted with ground glass globes, which gives this part of the boat a very pleasing effect. The freight deck lights are protected with guarded fixtures.



BOSTON AND PORTLAND STEAMER BAY STATE.

Cats and Cold Storage.

A story to the effect that a new breed of cats had been produced in the cold storage warehouses of Pittsburg went the rounds of the newspapers some months ago. A letter received from the secretary of the Cold Storage Company, and published in the June number of the American Naturalist, shows that the story has but slight foundation in fact. The letter reads as follows: "While there is some foundation for the newspaper article, it has been somewhat exaggerated. Our cold storage house is separated into rooms of various sizes, varying from 10° to 40° above zero. About a year ago we discovered mice in one of the rooms of the cold storage house. We removed one of the cats from the general warehouse to the room referred to in the cold storage house. While there, she had a litter of several kittens; four of these were transferred into one of the general warehouses, leaving three in the cold storage house. After the kittens were old enough to take care of themselves, we put the old cat back into the house we had taken her from. The change of climate or temperature seemed to affect her almost immediately. She got very weak and languid. We placed her again in the cold storage room, when she immediately revived. While the feelers of the cats in the cold storage room are of the usual length, the fur is thick and the cats are larger, stronger, and healthier than the cats in any of the other warehouses."

Poultry Cars.

The Live Poultry Transportation Company, which has offices in the Rookery Building, Chicago, has recently let a contract to the Ohio Falls Car Company for 38 cars. These cars will have a capacity of 16,000 pounds each, that is, from 4,000 to 5,000 head of poultry. The cars are 34 feet 10 inches long inside. This company has 150 of these poultry cars in service. They are without air brakes or vertical plane couplers, and it is said that the new cars are to be minus these improvements. Evidently the company is in the business for what it is worth. The National Car Builder says: "Some society for the prevention of cruelty ought to take it in hand. It would probably order a few more cars then, as penning several thousand chickens or other fowls in one car is as cruel as anything can well be, and probably quite as bad for the public health as any other kind of indiscretion practiced by greedy shippers."

Electric Fans Cause a Fire.

A fire started in the steamship Massachusetts at the foot of West Twenty-ninth Street, New York City, June 19. The outbreak was in the meat storage room in the rear hold, and was caused by the friction of two large electric fans which are used to keep the meat cool.

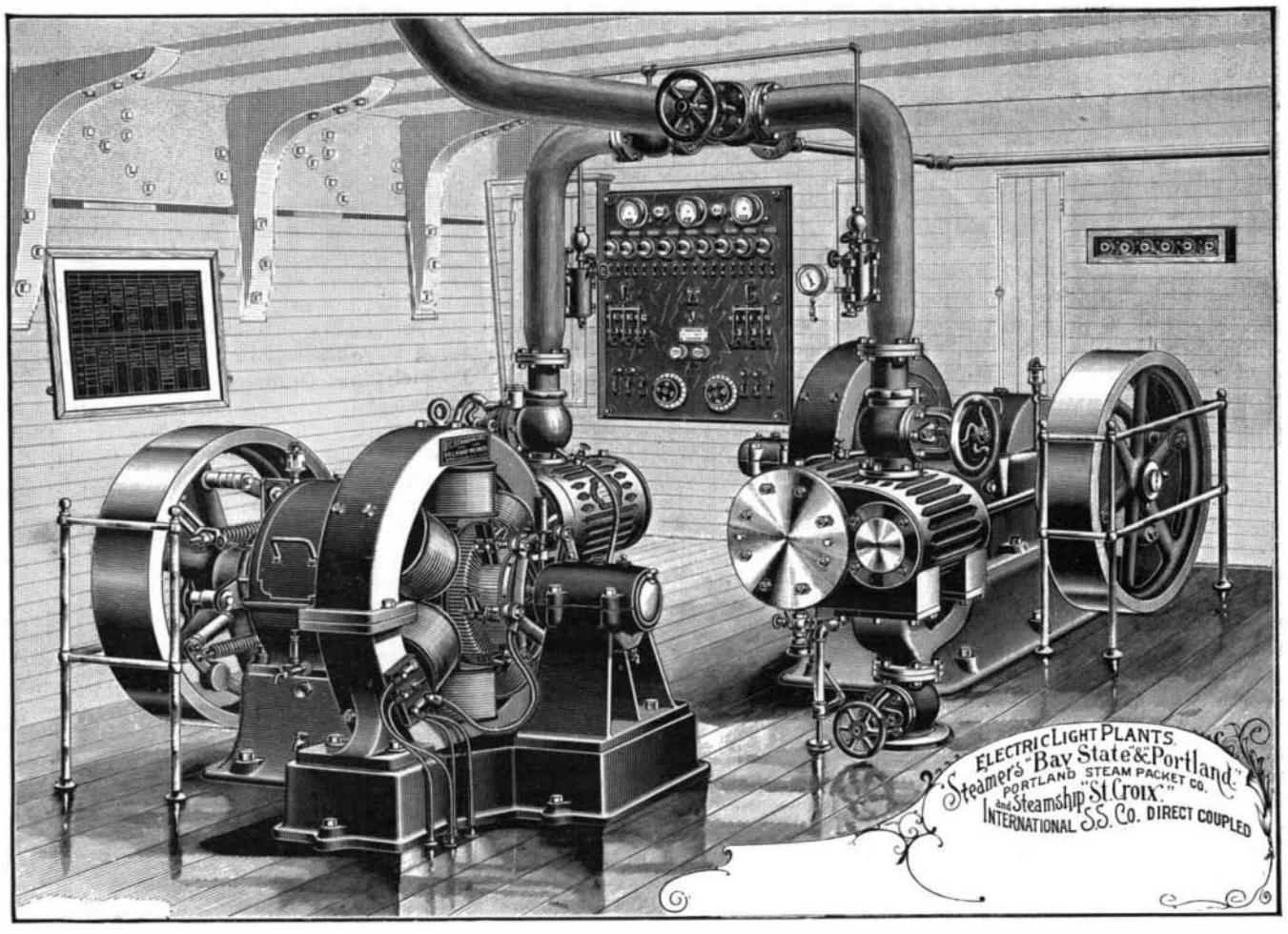
The fireboat Zophar Mills, which was soon on the spot, poured lots of water into the hold, soon extinguishing the flames. About $750 damage was caused. Several firemen were partly overcome by the fumes of ammonia, which is used in the refrigerating apparatus in preserving the meat.

Irone.

In the alcoholic extract of orris root the inventor has discovered a new substance, which is the aromatic principle of the root, which he gives the name "irone." It is a ketone, having the formula $C_{13}H_{20}O$. This body has the characteristic odor and flavor of the orris root, and may be preferentially employed in perfumery, etc. Its preparation is carried out thus: The alcoholic or ethereal extract of the root is distilled in a current of steam. Organic acids, ethers, alcohols and irone pass over into the distillate, which is then treated with ether and the ethereal solution agitated with a dilute alkali solution in order to separate the free acids. The mixture is evaporated down and the residue dissolved in alcohol, which solution is mixed at the ordinary temperature with a weak solution of an alkaline hydrate in order to saponify the ethers of the organic acids. After some minutes it is poured into water, the neutral oils are dissolved in ether, the ether is evaporated and the residue distilled in a current of steam. Irone is one of the bodies distilling over first, and by repeating this operation several times it may be obtained fairly pure, but still containing small quantities of aldehydes, which are eliminated by treatment with weak oxidizing agents. The irone is then converted into its phenylhydrazone or condensed with another substituted ammonia to a ketone, from which bodies it is obtained by decomposing with dilute acids and distilling.

Cavalry Telephone.

An interesting experiment of installing a telephone by trotting cavalry was recently successfully undertaken by some Prussian Uhlans between Berlin and Potsdam. Two sets of one officer and two non-commissioned officers proceeded in the early morning respectively from Berlin and Potsdam. Each set was equipped with a complete telephone apparatus which one of the men carried in a leather case on his chest, besides the requisite quantity of thin wire. The end of the wire was connected with the respective towns' telephone station, and the wire was, by means of a fork fixed at the end of the lance, thrown over the tops of the trees along the road. As each kilometer of wire was thus suspended a halt was made, and it was ascertained whether there was connection with the station. A new kilometer of wire was then connected with the former, and on went the men. The two sets met at Teltow. The wires, having been respectively tested with their respective stations, were connected, and telephonic connection between Berlin and Potsdam was established. The distance is about twenty miles, and the whole thing was done in about four hours.


ELECTRIC LIGHT PLANTS
Steamers "Bay State" & "Portland"
PORTLAND STEAM PACKET CO.
and Steamship "St. Croix"
INTERNATIONAL S.S. CO. DIRECT COUPLED

ELECTRIC LIGHT PLANT STEAMER BAY STATE.

Musky Trout.

In the vicinity of Geneva there is a manufactory of musk by means of chemistry, which stands on the banks of the Rhone and the waste products are discharged into the river. As a consequence it is found that trout and other fish in the neighborhood have a musky savor, but whether, like some other fishes, they are attracted by the scent of the musk and eat the waste products or simply become impregnated with the perfume has not yet been ascertained.

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AUTOMOBILE CARRIAGES.

Since the early days of the present century a practical road carriage which should carry its own means of propulsion has engrossed the attention of many inventors. To-day we are treated to a spectacle of an automobile carriage with four passengers which can travel 750 miles at the rate of nearly 16 miles an hour. We have at various times illustrated all of the leading horseless carriages, and we now present views of the prize winners at the recent Paris-Bordeaux race.

This race began in Paris on June 11; the course was from Paris to Bordeaux and return. The distance was about 360 miles from Paris to Bordeaux. Under the conditions of the race only four-seated carriages could compete for the first prize of 40,000 francs, or $8,000. Special prizes were also to be awarded to automatic and petroleum velocipedes. Sixty-six horseless vehicles propelled by petroleum, steam power, or electricity and five or six petroleum bicycles competed. The preliminaries were arranged with great care, checking stations being provided to insure the integrity of the race. Special telegraph wires were laid along the route to transmit news of the progress of the race to Paris. The race was witnessed by many thousand people on the line of march. The first vehicle to arrive at Bordeaux was MM. Panhard and Levassor's petroleum carriage, which reached Bordeaux at 10:32 on Wednesday morning, the start having been made at Versailles at nine minutes past noon the previous day. A stop of only four minutes was made, when the return trip was begun. M. Levassor's time to Bordeaux was 22 hours 28 minutes over a distance of 585 kilometers (363 miles). The speed was 24 kilometers 400 meters an hour, equivalent to about 15 miles. The carriage of MM. Panhard and Levassor met with an accident shortly after leaving Bordeaux, which delayed it over an hour, which makes the run more creditable. This carriage made the entire trip in 2 days and 53 minutes for the round trip of 1,170 kilometers (727 miles), being at the average rate of 14·9 miles an hour. Many of the other vehicles made splendid time.

The contest was arranged by Mr. James Gordon Bennett, Baron de Neufeldt, and others, who it is said paid for the prizes. The Panhard and Levassor's carriages, four in number, were propelled by the well known Daimler motor, which has achieved so much success in both this country and abroad. In the SCIENTIFIC AMERICAN for February 7, 1891, we illustrated the Daimler motor and some of its applications.

The American company will bring out, within a few months, a carriage adapted to our American roads. Their factory is located at Steinway, Long Island City. We illustrate the small carriage of MM. Panhard and Levassor, which took the second prize, and also its arrival at the Porte-Maillot (Fig. 4), Paris, on the return trip.

The carriages were constantly accompanied by bicycle riders who were soon distanced. The roads along the route were filled with enthusiastic spectators.

Though the two-seated carriage (No. 5) of MM. Panhard and Levassor (Fig. 1) arrived first, it received only second prize, the first prize being taken by the four-seated carriage of Les Fils de Peugeot Frères, No. 16; the third was taken by a two-seated vehicle by the same party, No. 15, as was also the fourth, which was for a four-seated vehicle. (See Figs. 2 and 3.)

The Fils de Peugeot Frères carriages, like those of MM. Panhard and Levassor, were driven by petroleum motors. The gas, steam and electric driven carriages did not make a very good showing in the recent race.

The roads in America are not good enough except in certain localities as yet to permit of a very rapid development of the automobile carriage, but their use in great cities is likely to be rapid. An attempt will soon be made in New York to prove to the owners of a large retail dry goods store that mechanical power is cheaper and more efficient in the delivery of packages than wagons drawn by horses, and the Society for the Prevention of Cruelty to Animals is already figuring on the cost of making the change on its ambulances from horses to Daimler motors. For our engravings we are indebted to L'Illustration.

Fig. 1.—PANHARD AND LEVASSOR CARRIAGE (No. 5)—SECOND PRIZE.

Fig. 2.—THE FILS DE PEUGEOT FRERES CARRIAGE (No. 16)—FIRST PRIZE.

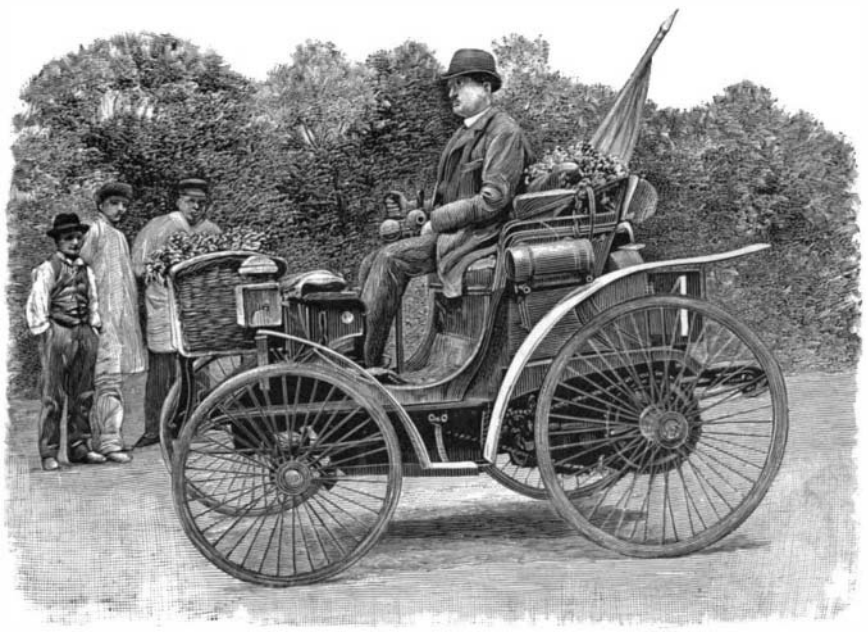

Fig. 3.—CARRIAGE No. 15, WHICH ARRIVED SECOND—THIRD PRIZE.

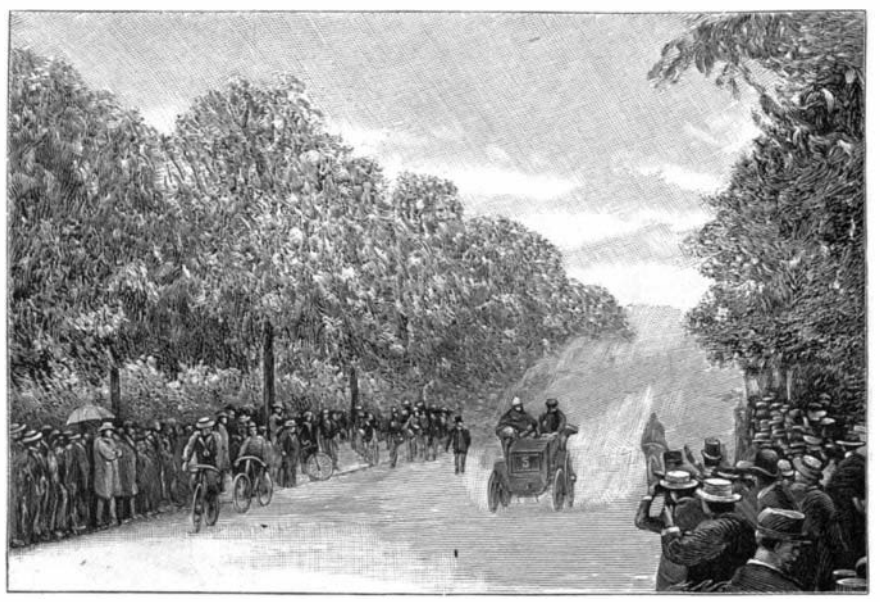

Fig. 4.—CARRIAGE No. 5 ARRIVING FIRST AT THE PORTE-MAILLOT, PARIS.

The Cigar Case Borer.

A comparatively new pest of fruit trees is the insect called the cigar case borer, which last year probably ranked next to the bud moth, in New York, in destructiveness. In a bulletin from the Cornell Experiment Station, Mr. Slingerland says that it has probably been present in limited numbers in the orchards of this State for many years, but public attention was not called to it until 1888, when Mr. Patrick Barry found it boring holes in newly set pear fruits. In 1892 Dr. Lintner received some apples from Oswego, which had apparently been bored by this insect, and in 1894 specimens were received at the experiment station of Ithaca from a great number of places, showing that it was present in alarming numbers. So far the insect is recorded only from New York and Canada, but it will probably be heard from soon over a much wider range of country. Owing to its small size and peculiar habits the insect in any stage will be rarely noticed by the fruit grower, and yet the second one of the curious suits or cases which the little caterpillar wears is conspicuous enough to reveal its presence to the casual observer. The first suit is manufactured in the fall, to be worn all winter, but about the 15th of May the half grown caterpillar finds this too small, and proceeds to make a summer suit which resembles a miniature cigar in shape and color. These cigar-like objects can be seen moving over the leaf of a plant, although scarcely more than one-fifth of an inch in length, and when disturbed the little creatures retreat into them. The first indication of the insects' presence occurs on the swelling buds of apple, pear, or plum trees. Two or three have often been seen on a single bud busily at work eating holes into them no larger than a pin. The work on the expanded foliage is seen in skeletonized dead areas, which have near their centers a clean cut round hole through one skin, usally on the under side of the leaf. The caterpillars also often attack the growing fruit. The bulletin gives the life history of this most interesting insect, from which it appears that it is only practicable to fight it while in the caterpillar stage, and then it is so well protected in its case as to render its destruction impossible unless the work is very thorough. It can probably be kept in check by two or three thorough sprayings with Paris green, if used at the rate of one pound to two hundred gallons of water. The first application, which may be effectively combined with the Bordeaux mixture for the apple scab fungus, should be made as soon as the little cases are seen on the opening buds. A second and perhaps a third application may be necessary at intervals of from four to seven days on badly infested trees. These sprayings will also check the bud moth. It has also been found in Canada that a kerosene emulsion spray applied at the same time as directed for Paris green is a still more effective check upon the case borer, and will probably be so on the bud moth. In pear orchards this insect and the psylla can be checked by a spray of the same emulsion when the leaves are opening. It should be remembered that a fruit tree ought never to be sprayed when in blossom, and that success in any case will depend almost entirely upon the thoroughness with which the work is done.

BAGGAGE is moved from one end to the other of the Victoria station, at Manchester, in basket trucks running along a light electric railroad suspended from the roof of the station. The trucks are lowered by chains to any platform desired.

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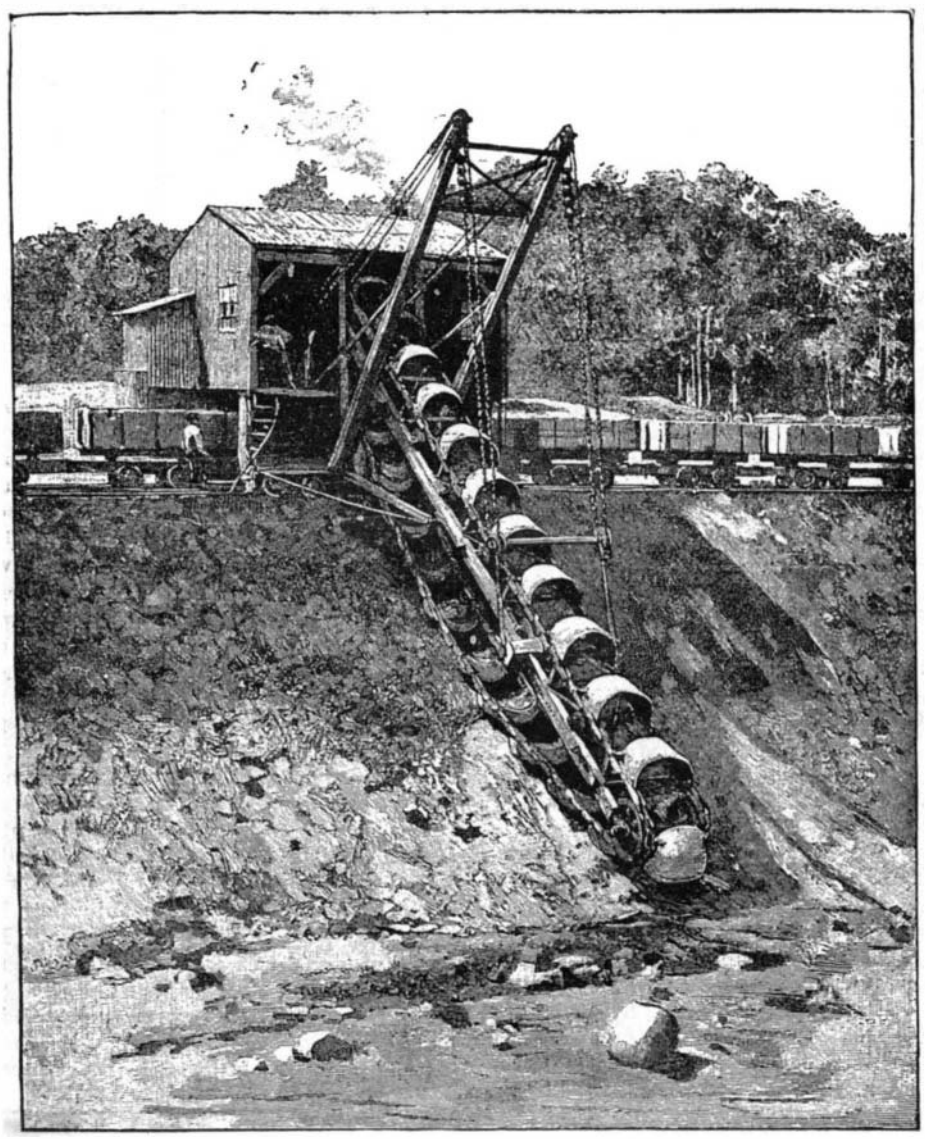
THE NORTH SEA SHIP CANAL.

In our number for June 22 we gave maps showing the location of this great engineering work, which, starting at the mouth of the River Elbe, in the North Sea, extends across the peninsula, a distance of 61 miles, to the bay of Kiel, on the Baltic. The canal passes through a level country for the most part, although in some places the cutting down of high embankments became necessary. We give from Illustrirte Zeitung characteristic illustrations, showing some of the scenery along the route of the canal, and also pictures of some of the machinery employed in the execution of the work.

One of our engravings is a pastoral scene near Burg, in Dithmarschen, showing the canal in the distance.

Another is a view of the banks of the canal near Knoop. In the work of removing the earth to form the ditch or canal proper, strong bucket scrapers operated by steam were employed. These lifted the dirt into cars with great rapidity and economy. One of our engravings shows a steam scraping machine at work. Another engraving shows one of the great steam dredging floats at work. In this case the silt, which is lifted by an endless chain of buckets, is carried through a tube for a long distance and deposited along the bank of the canal, as shown.



THE NORTH SEA CANAL—A STEAM SCRAPER AT WORK.

Gold Lacquer Photographs.

Before entering into the details of making such gold lacquer photographs, we shall describe their appearance, and, in outline, how they are made. The patented pictures appear like our ordinary gold lacquer work with photographic picture on them. They are very beautiful and artistic. Wooden boards or boxes which have a flat or nearly flat or a cylindrical surface, such as hanging panels, handkerchief boxes, cylindrical flower vases, etc., are coated with black lacquer, and the part where the pictures may be put on is gold lacquered with some layers of gold leaf, and the remaining part or margin of the pictures is decorated with gold lacquer paintings. The picture is put on the gold ground by the well known "dusting on" process, fixed with another coat of rather transparent lacquer and is polished.

The margin of the picture is finished in bright polish or matt, with gold lacquer decorations painted or plain. In the case of panels, the decorated margin itself makes a very attractive frame.

Lacquer work is one of Japan's chief products. In no other place in the world is this work done except in China, and Chinese lacquer work is far behind Japanese. There is, in fact, no comparison between the two. Every one who has seen really good Japanese lacquer work must admire its beautiful appearance and hard texture. The lacquer protects the materials from injuries arising from dampness of air and from all kinds of acids

Lacquer is made from the gummy juice of a particular tree, growing both cultivated and wild, called Urushi-no-Ki, which means lacquer tree. The trees from which the lacquer is collected are mostly cultivated for this particular purpose. In the season of the year when the sap current is rising, men make a cut on the trunk of the lacquer tree, and from this cut gummy juice is collected by scraping it with a peculiarly shaped stick. This is refined to lacquer by evaporating the watery part.

This refined lacquer may be used with or without coloring matter. That used without coloring matter is always black, chocolate or light umber, and those with the mixture of coloring matter can be made in various colors.

The lacquer coating is done as a special branch of occupation; the patentee also leaves it in the hands of the lacquer painters. The things to be coated are first prepared with body lacquer consisting of a mixture of hard lacquer and fine brick dust. After the preliminary coating has dried it is ground down smooth, with a kind of snake stone, and then with charcoal, to give the finishing coat. After receiving the last coating, it is brought to either a bright or a matt surface, and at the part where pictures are to be put on, a gold ground is laid with two or three layers of gold leaf. This gold ground is also fixed by a protective coating of lacquer. When the work is so far finished, the things are sent to a gold lacquer painter, where the decorative gold painting is done.

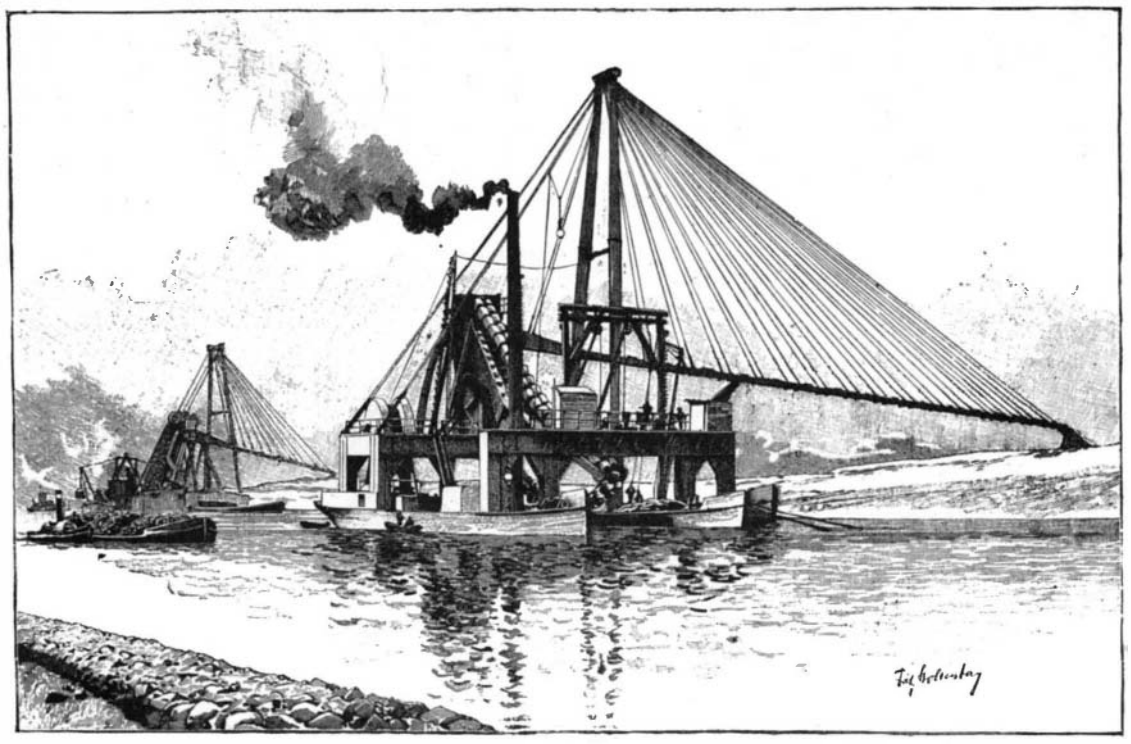
The patentee takes these prepared boards, panels, etc., he makes photographic prints on them by means of the "dusting on" process. Any good formula for the "dusting on" process will be found suitable.

First, this dusted on picture is fixed in the ordinary way, and when it is dry a protective lacquer coating is put on and polished. This is all that has been patented by Mr. Mizuno, of Yokohama, in connection with the gold lacquer process.

We suggest a method quite similar to the patented process, as regards result, which is easier, and at the same time cheaper. In this country it is very easy to get lacquer made, but where it cannot be got it would be necessary to import the materials from Japan or to be satisfied with a fine black French polish, gilded where the picture is to be printed.

Upon this prepared surface we might put the picture by the "dusting on" process or ordinary carbon transfer process. The picture being fixed might be protected by some hard transparent oil varnish, such as best copal varnish. Dammar varnish is the most transparent of all, but it is not so hard as copal. Although no varnish protection is as hard and strong as lacquer, we consider that a really good varnish is as strong as is necessary for the purpose under consideration. The method we suggest will make quite as attractive a picture as that produced by the patentee's process and at a cheaper rate.

As to the patentee himself, we trust that he will adopt no process more simple and cheap than the one he has patented, but will continue to turn out the high class articles that he has heretofore, and will retain his well merited reputation.— Shashin Sowa, Photographic News.



THE NORTH SEA CANAL—A STEAM DREDGE AT WORK.

Shipbuilding for the Year.

The Bureau of Navigation has received preliminary returns showing that 682 steam and sailing vessels of 132,719 gross tons were built and documented in the United States during the last fiscal year, compared with 776 steam and sailing vessels of 121,547 tons during 1894, an increase of 11,000 tons. Final and revised returns will somewhat increase the figures by the addition of barges, etc. Steam vessels numbered 283, of 75,728 gross tons; sailing vessels, 399, of 56,990 tons, a decrease of 8,000 tons steam and increase of 19,000 tons sail compared with 1894.

Among notable additions of the year to the merchant fleet are the steamers St. Louis, Northland and Newport News.

Among the notable American marine disasters of the year are the recent foundering of the steamship Colima; the loss of the steamship Keweenaw, reported missing with thirty-one lives on the Pacific; the stranding of the steamships Cienfuegos and Ozama, and the loss of the steamship Chicora on Lake Michigan.

Test of the Niagara Electric System.

The first practical demonstration of the system of transmission to be employed by the Cataract Construction Company in carrying the electric power to its customers took place June 29. Two thousand horse power was conveyed from the power house to the works of the Pittsburg Reduction Company, a distance of three-quarters of a mile.

Its course was first through the subway to the transformer building, where the alternating current, by passing through both static and rotary transformers, is changed to a direct current, then sent to the factory. The machinery worked smoothly, and the test was pronounced an entire success.

Among those present were President Seller, of the Niagara Falls Power Company; Chief Electrician Thompson, of the General Electric Company; Chief Engineer Breckenridge, of the Cataract Construction Company; Superintendent Emmett, of the General Electric Company; and the engineers of the General Electric Company who have been in charge of the work.

A Law for the Protection of Pneumatic Tires.

A Chicopee, Mass., ordinance is as follows: No person shall put or place, or cause to be put or placed in or upon any street, lane, alley, or other public place in the city, any ashes, glass, crockery, scrap iron, nails, tacks, or any other articles which would be liable to injure or damage the tires or wheels of bicycles or any other vehicles which have wheels with rubber or pneumatic tires. Any person violating the provisions of the preceding section shall be liable to a fine of not less than $2 nor more than $20 for each offense.

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Correspondence.

Force and Energy.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue May 11, 1895, an editorial article appears under the above caption. While the subject is discussed in a profound and intelligent manner from the standpoint of experience, yet in the mind of a less intellectual person, like the present writer, there is more or less doubt on the conclusions arrived at, and stated as axioms. The terms energy, force, and work are plainly defined, as is also the various relations of the trio. The assumption that "the doctrine of the conservation of energy tells us that the available energy of the universe is tending to zero" is without foundation on bed rock. Your statement that "energy is defined as the capacity of doing work" cannot be doubted, but that such energy in the universe is tending to zero may be confuted by a reference to that which has existed without diminution for all known time in the past. Our earth has continued in its revolutions and circles around the sun, as well as all the bodies in our solar system, for all past ages without deviation. The power or energy which causes the lightning's flash and the thunder's bolt, with all its destructive effects, is the same to-day as it was a thousand years ago. Why should it be said that the accomplishment of what is termed "perpetual motion" is impossible? Who knows but that some genius may arise who will grasp the situation and comprehend the power or energy that moves the worlds? There is no steam engine in the clouds to run a motor. Yet the lightning comes forth with a power that cannot be computed! A million horse power could not produce the effect that a single flash has been known to accomplish.

The age for doubt has gone by, and he that will look around and behold the wonders that have been accomplished within the past fifty years will set no bounds to the future. There are certain fixed laws in Nature which are as unalterable as were ever the laws of the Medes and Persians, and much more perpetual, that may be yet used by the coming man.

We are constantly learning something, and new and unexpected results follow investigation.

Energy will yet accomplish many things that are now deemed impossible, among which will be a contrivance that will move by Nature's fixed forces, without any outside help from man. The mistaken notion that man must produce the energy is but human. Nature will produce and furnish all energy necessary to accomplish great ends; and it only remains for man to put the giants in harness and stand at the helm.

May the good time hasten on!

Asbury Park, N. J. DAVID H. WYCKOFF.

Science Notes.

The Decimal System in the Measurement of Time and Angles.—According to the Genie Civil, the Geographical Society of Toulouse has for some years been studying the possibility of the application of the decimal system to the measurement of time and angles. As a result of these studies, a scheme has been devised which is to be presented to the coming Geographical Congress at London. It is proposed to divide the circle into 100 "cirs" (abbreviation of circulus), with decimal subdivisions of "decirs," "centicirs," "millicirs," and "dimicirs." The letter X (initial letter of Greek κυκλος) is chosen to represent the cir, and an angle of 7 cirs, 77 centicirs, and 51 dimicirs would, therefore, be written 7ˣ7751.

For the decimal measurement of time, the day, from midnight to midnight, is divided into 10 decimal hours, each hour into 10 "cés" (abbreviation of centijour), each cé into 10 "décicés" or decimal minutes, and the latter into "centicés," "millicés," "dimicés," etc.

The passage from the present measurements to the new ones will be easy to realize. The conversion of the degrees, minutes, and seconds of arcs into cirs and divisions of the cir will be effected by means of a table that Mr. De Rey Pailhade has calculated up to less than a half unit of the seventh decimal, that is to say, to less than 0·000648".

From experiments made in Italy for calculating the time gained by the use of decimal measurements, it results that such use shortens the duration of the work by two-sevenths (almost one-third), either in observation or in calculation. It will be seen that such a gain is not negligible.

Tannin from Palmetto Leaves.—The extraction of tannin from the leaves of the palmetto has now become a practical industry, and it is claimed that leather tanned with this product can be produced more economically than that which is treated with oak or hemlock bark, while the residue forms a valuable paper stock, which is also utilized. In the process of extraction the leaves and stems are separated, the stems are crushed flat through rollers, while the leaves are finely shredded. This material is then placed in a large wooden tank and covered with water, the mass is brought to the boiling point, but not allowed to boil violently, being kept near but below the boiling point for forty-eight hours, the liquid being then ready for the tannery. After the tannin has been extracted, the palmetto is steamed in a chemical solution, which removes the silicate contained in the leaves and changes the glossy shield to a gummy mass that can be removed without injury to the fiber. But in making imitation horse hair this gummy mass is allowed to dry, since it adds elasticity to the fiber. There are several combinations in which the production of tannin and fiber is said to be practicable and advantageous, so that tanneries situated in the vicinity of paper mills can grind the palmetto in the same manner as bark, and the residue, after bleaching, is in proper shape for the paper mill.

Origin of Chemical Terminations.—The terminations in the words "sulphate" and "sulphite" are of French origin. In 1787 the method of chemical nomenclature proposed by Morveau, Lavoisier, Berthollet, and De Fourcroy was published, and this still forms the basis of the present system. Lavoisier's ideas were most prominent in the scheme which was practically an embodiment of his antiphlogistic doctrines. The compounds of oxygene were divided into oxides and acides, and the names of the latter were distinguished by the terminations -eux (Ang. -ous) or -ique (Ang. -ic) respectively, according as the acids contained more or less oxygen. The important rule was also introduced, and is still maintained with its original force, that the names of salts formed from acids distinguished by names ending in -eux (-ous) should terminate in -ite, and those from acids in -ique (-ic) should terminate in -ate.—Pharm. Jour.

New Adjunct to the Balance.—In order to enable workers with the balance to read the position of the pointer more accurately and readily, resort is often had to the device of fixing a magnifying lens before the divided scale. Another simple contrivance is suggested by W. H. F. Kuhlmann (in Zeitschrift fur Instrumenten), in which the scale is reversed, so as to face a concave cylindrical mirror attached to the column that supports the balance. The pointer is made finer at the end than usual, and moves between the scale and the mirror in which a magnified image of the pointer and the scale appears.

Influence of Trades on Faces.—A curious paper is contributed by Dr. Louis Robinson to a recent number of Blackwood's on the influence of trades on faces. It is pretty generally agreed that association with horses gives a person a horsey look; but it appears that circus riders and ring-masters are exempt from the general rule, because with them the horses are regarded as mere "properties," and their minds are occupied solely with the achievement of certain feats to the satisfaction of the public. Dr. Robinson takes as types professional musicians, priests, actors, actresses, and blacksmiths, and shows how their pursuits induce strongly marked facial expression. Even the style of hair which has become associated with musicians is not altogether dependent on fashion, but is evidence of trophic changes resulting from mental habits. The growth and vitality of the hair are profoundly influenced by emotions. Priests cannot change their priestly countenance if they wished. For some mysterious reason the subcutaneous tissue over the cheek-bones and under the jaws of the cleric's face gets an undue supply of nourishment, which leaves distinctive marks, while the consciousness of a share in the apostolic legacy gives a muscular set to the lips. Dr. Robinson goes on to discuss the other classes mentioned in the same strain, and he ends by saying that the aim of the paper is to aid those who are endeavoring to place physiognomy on a sound basis. The task is a difficult one, because in the course of the article he admits that not only may the organic part of a man show every sign of guilt when there is no guilt, but only temptation; but it may even go further, in attaching a slanderous libel to the countenance, owing to the interlocking mechanism of emotion, passion, and nutrition.

Masonry Bridges.—Two masonry bridges have recently been constructed in Austria which are said to be the largest of their kind in the world. One of them, situated at Jaremeze, has a main span of 206·5 feet. The other, situated at Jaruna, has a span of 157·5 feet. About thirty-five thousand cubic feet of cut stone were used for the first of these bridges. About fifty-five tons of Portland cement and some four thousand cubic feet of ordinary mortar were used in the work. In beginning the work, the centering was loaded simultaneously at eight different points. The weight over the haunches is relieved by spandrel arches. The other bridge is similar in design. The total cost of the Jaremeze bridge was $36,000.

Improving the Flavor of Butter.—Prof. H. C. Conn, says Food and Sanitation, has for the past two years been experimenting in the direction of discovering and cultivating the proper bacteria for improving the flavor of butter, and recently experiments have been made by him in the production of creamery butter. As a result of such experiments, it is now stated that Prof. Conn has discovered a species of bacterium to which he has applied the insignificant name of "Bacillus No. 41," and which has given the most promising results as an organism for the artificial ripening of cream in butter making. These experiments, as carried on by him, were thoroughly satisfactory, and were made in the following manner: One-half a pint of milk was sterilized, by incessant steaming, during a period of three or four days. Then this bacillus No. 41, which had been cultivated in the bacteriological laboratory of Wesleyan University, was inoculated into the milk, and for two days was allowed to develop. The large creamery at Cromwell, Conn., was then visited, and six to eight quarts of cream were put into a metal vessel and "pasteurized." The cream was then heated to 158 degrees Fah., and left for ten minutes. The vessel was removed and cooled quickly by means of cold water, and when the temperature had dropped to 80 degrees bacillus No. 41 was poured in and the mixture stirred thoroughly. The vessel was then covered and put into the ripening room. After a couple of days the cream was churned, and the buttermilk remaining was set aside for future use. These six quarts were ripened for the purpose of increasing the number of bacteria, and securing a strong culture for use in the large cream vat of the creamery. The buttermilk was then inoculated into the day's cream supply, and this cream allowed to ripen in regular time, at a warm temperature, and churned as usual. Before churning a quantity was set aside to use for inoculation in the next day's supply, and in this manner continued indefinitely. The effect was always uniform. The first six quarts of cream produced moderately good butter, but not quite of the flavor wanted. The first large churning was a trifle better, and each day's product was an improvement. A delicate flavor also developed, which seemed to deteriorate after two or three weeks. This deterioration was remedied by a fresh inoculation from the laboratory. Two vats of cream, from which June butter was made, were taken. One quantity was inoculated, and the other was not. The butter produced by each was of high quality, but that which had been inoculated with bacillus No. 41 had an aroma stronger and more pleasant than that without. It was also superior both in taste and odor. One lot was sent to a Mr. Beck, in Massachusetts, who makes the highest grade of butter, and who commands a very high price in the Boston market. Mr. Beck used the culture and reported a decided improvement. It is the purpose of Prof. Conn to introduce this inoculation process in all the large creameries in the United States within the next year.

The Size of Drops.—At a recent meeting of the Royal Society of Edinburgh a communication "On Drops" was read by Mr. J. B. Hannay, who appears to have obtained experimental verification of Tait's conclusion reached some years ago. Thus, the size of the drop does not depend upon the weight of the liquid, but is proportional to the diameter of the delivery tube, while its separation is regulated by surface tension rather than by cohesion. In the experiments, the disturbing element of viscosity was got rid of by causing a given liquid to drop into another of different specific gravity. The separated particles of water, for example, were allowed to rise in oil. It was further ascertained that when water was dropped in an atmosphere of benzine vapor the drops formed were much smaller than when the surrounding medium was ordinary air.

Diffusion of Perfumes.—J. Passy (Comptes Rendus, cxx, 513) considers that the fixation of perfumes by solid bodies, when diffused in an inclosed space, must be due to a process of solution similar to that by which dyes are fixed in tissues. He argues that, in the same way that crystallized fuchsine is greenish with a metallic luster, and only manifests its characteristic color when in solution, so coumarin in the crystalline state does not present its characteristic odor. Presumably, therefore, tissues perfumed by coumarin contain it, as it were, in solution.

Recovery of Tin from Tin Plate Clippings.—Mr. T. Hunter extracts the tin from scrap tin plate by treating the latter with a solution of sulphate of copper, which dissolves the tin in the state of sulphate, while at the same time metallic copper is deposited. In the presence of the iron the sulphate of tin is decomposed in turn with the setting of metallic tin at liberty and the formation of a solution of copperas.

In reality, it is found that the solution of copper corrodes the iron and detaches the tin that is fixed to it. Beneath a double bottom, upon which the tin clippings are arranged, there collects a mixture of tin and copper, which is separated, or which is utilized directly for the manufacture of stanniferous brasses or bronzes.

Prevention of Boiler Scale.—To prevent the formation of scale in steam generators, Mr. Alwin Nieske, of Dresden, recommends the addition of chromic salts to the feedwater. The lime existing in the latter in the state of bicarbonate or sulphate is precipitated by such salts in the form of a non-adhesive light mud. Bichromate of potash may be used in the proportion of two pounds for a small boiler; but an excess of the salt would be attended with no inconvenience.

TRUNK wires to connect London by telephone with Edinburgh, Glasgow, and Dublin have just been erected by the British post office.

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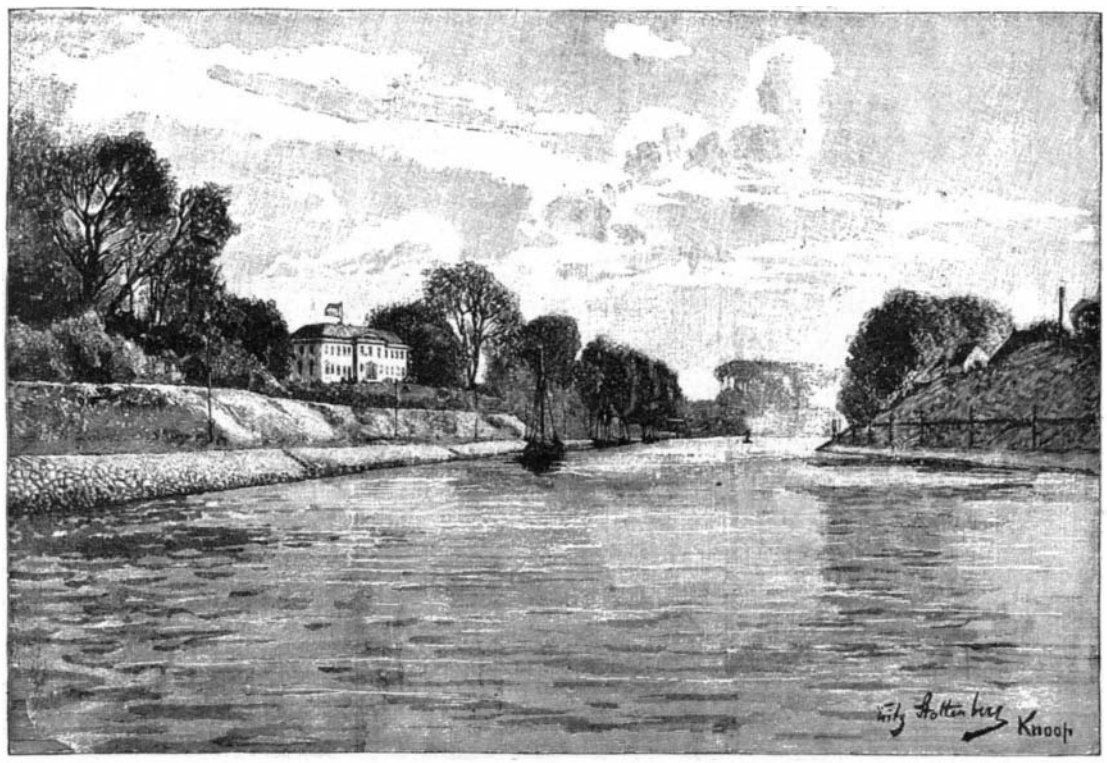
[FROM THE NEW YORK SUN.]

The Horse and the Bicycle.

The present prices of horses of average and even the better quality are lower than ever before in the history of the market. The business of horse raising has ceased to be profitable, unless it is confined to varieties of the breed for which there is a fashionable demand or which are distinguished for their speed. At the same time there is a falling off in the demand for carriages. With very good reason, the horse dealers attribute this decline in great part to the present passion for bicycle riding: and the use of electricity and cables for horse traction on the street railways throughout the Union has, of course, very much to do with it. The horse has been displaced, to a large extent, by these new agencies both as a beast of burden and an animal used for pleasure. The dealers, however, profess, and perhaps feel, confidence that the competition of the bicycle is due to a merely passing fancy or hobby. They say that the passion for bicycle riding is too violent to last, and that in the course of one or two years the horse will resume his place in the interest and affections of men and women, and the machine will be laid away as a toy of which people have grown weary. The diminution of the demand for draught horses because of the substitution of electricity for horse power, they admit, will continue indefinitely and steadily become greater. Here in New York, for instance, the time is near at hand when it will displace horses entirely from the street railways, and the same will be the case with the cities and towns of the Union generally. The experiments with carriages run by electricity or petroleum, which have been made recently in France, suggest that the horse will have a new competitor not merely in the cities, but along country roads and in agricultural operations. As it is, a very fair horse can be bought for about the price of a cow. The rare and incontestably superior beast may fetch about as much as ever, but the ordinary horse of ordinary and even good breeding is very cheap.

The use of the bicycle has increased at a rapid rate during the last year. It would be safe to say that there are three times as many wheelers as there were last summer, though then the number was great. Probably there are five times as many. The level roads in the neighborhood of New York are crowded with bicycle riders on Saturday afternoon more especially, and on all days they are numerous, and much more numerous than the people who drive horses for pleasure. Men who were once accustomed to take a drive for recreation when they reached the country from town, now to a large and increasing extent prefer bicycles. Consequently the driving has undergone a very perceptible diminution. Neither are they generally young fellows of sporting proclivities. Very many of them are gray haired men, who declare that they find in wheeling a needed recreation which driving does not furnish. Very many of them also are women, old and young. A great part of the country girls themselves are now expert wheelers, and the feminine visitors from town swell the numbers largely. Doubt as to the propriety of riding a bicycle has passed away, for fashion has set its stamp of approval on the practice and supplied conspicuous examples of it which have released the feminine mind from fear of offending conventionality by mounting a bicycle. Accordingly, man and wife, father and daughters, are frequently seen wheeling along the roads together in a high state of enjoyment.

The ambition to acquire the art of managing the machine, thus stimulated, is rapidly extending among men and women both, and as it is easily gratified now that numerous schools for the preliminary instruction have been established, the practice of bicycle riding is increasing faster than at any previous time since the machine was introduced and brought to perfection. If people cannot afford to buy bicycles they hire them. Meantime the use of the bicycle simply as a means of transportation and for business purposes is extending correspondingly. It is in general employment in the country by messengers, mechanics, professional men, merchants, school teachers, and all persons who have long or considerable distances to go in the pursuit of their business. Children ride it to school. Clergymen use it even in making their pastoral visits, doctors in going their rounds. Its first cost paid, it requires no further expenditure except for occasional repairs. It does not have to be fed like a horse, and no one needs to be hired to take care of it. It extends greatly the region over which carpenters, masons, plumbers, or gardeners can make their work profitable, and to such it has become indispensable. They have all the advantages and none of the disadvantages involved in keeping a horse. They can make better time than the millionaire in his costly equipage. Accordingly, the assumption of horse dealers that bicycle riding is a mere fad, an ephemeral hobby, does not seem to be justified. Evidently the machine has come to stay. It may be that its use simply for sport and recreation will diminish hereafter, something else coming up to replace it in the popular fancy, but before that decline sets in, if it does occur, the passion for bicycle riding will doubtless increase and extend greatly. Multitudes of people yet remain to be affected by it; but as a machine for various use as a means of necessary transportation it must continue to be employed permanently by greater and greater numbers of people. Very many of them, it is true, have never been horse buyers, but the machine will enable thousands of people in all parts of the Union who have depended on horses to get along without them wholly or in part. Only five more years remain of this century, but they are likely to be accompanied by some of the most important changes in civilization, wrought by new means of transportation and locomotion, which have occurred since this wonderful nineteenth century of mechanical invention and scientific discovery was ushered in.



THE NORTH SEA CANAL—VIEW NEAR KNOOP.

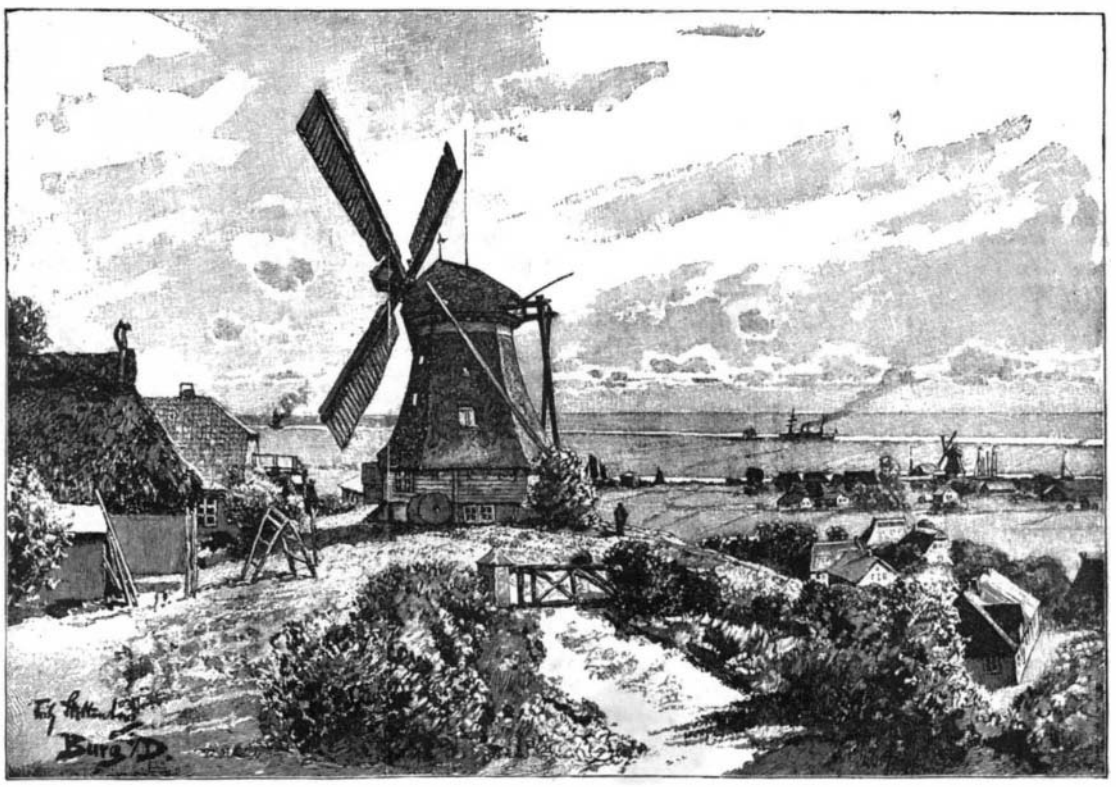
Naval Notes.

The plans for the two new battleships, the construction of which was authorized by the last session of Congress, are now being drawn. The act provides that the cost shall not exceed $4,000,000 each and that they shall be designed to carry the heaviest armor and the most powerful ordnance suitable to vessels of 10,000 tons displacement. It is also provided that one shall be built on the Pacific coast and the other on the Atlantic coast.

In the matter of protective linings against leakage from shot holes, both fire and water tests continue to show the advantages of the cornstalk cellulose over the cocoa product. The cocoa fiber was made to flame by an ignition which only blackened a little of the cornstalk cellulose. Streams of water were directed against the holes made in the cofferdams by the guns in the recent tests at Indian Head proving grounds. The hole made by the six inch shot in the cocoa cellulose washed out in half a minute to the depth of eighteen inches and that of the cornstock cellulose to a depth of less than four inches. Powerful streams were directed upon the eight inch shot hole, and the cocoa cofferdam was bored completely through in nine seconds, but the cornstalk cellulose took twice as long.

The war ship Columbia made the trip across the Atlantic on her way to Kiel in a little less than nine days, being about 50 per cent longer time than the mail steamers require. When the Columbia entered the British Channel, she made a short spurt at the speed of 20 knots.

A complete frame from the battleship Iowa will be set up at the Indian Head proving ground, a fourteen inch armor plate will be attached to it, heavy guns will then be fired at the plate. The structure will be about eight feet high and five feet thick. It will include a sufficient number of ribs to back the plate about sixteen feet. Five inches of wooden backing will be used and the Harveyized armor plate will be attached to it by twenty-six bolts of new design. The frame is to be constructed at the Norfolk Navy Yard. The frame will be attached to the hillside, so as to secure the same conditions as in battle.



THE NORTH SEA CANAL—VIEW NEAR BURG IN DITHMARSCHEN.

The Arawaks.

In the Port Royal Mountains, Jamaica, an interesting archæological discovery was recently made of a cave containing the skeletons of at least twenty-four of the aboriginal Arawaks. When Columbus discovered the island in 1494 the Arawaks were estimated at about 600,000. A century and a half later, on the capture of Jamaica by the English, they had completely disappeared, even to their bones, as only the skulls until now had been found. These showed a frontal depression with lateral expansion, an artificially formed deformity that is also found in those just discovered, which are of all ages. A shattered canoe of cedar wood, 7 feet long and 1½ feet wide, an arborvitæ mortar, and two earthen ware vessels were found with the skeletons.

DR. CHADWICK thinks that bicycling is a most desirable form of recreation and exercise for women, and his purpose in bringing the subject up for discussion is to stimulate the inventive minds of its advocates to devise a saddle which shall not inflict local injury or discomfort upon women riders.

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Washington Timber.

The Puget Sound Lumberman says: "Many estimates have been made of the amount of standing timber in the Pacific Northwest. In every case they were confined to the western portion of the State, leaving to the reader the task of 'guessing at the rest.' The estimates, too, were made in round numbers, leaving the impression that truth was lacking. The estimates that the Lumberman presents in this issue were carefully made. Of course, in a country so sparsely settled as the Pacific Northwest, it is impracticable to get at the actual number of feet, but the figures here given are as nearly correct as it is possible to get them. In gathering these figures, the Lumberman used three sources of information, viz., county surveyors, mill men and cruisers. The county surveyors, through intimate knowledge of their respective counties, were able to give the number of acres of timbered land; the mill men and cruisers, through their familiarity with the timber, were depended upon to give the number of feet to the acre. The surveyor also gave his estimate, and between the three it was possible to obtain an average. The figures given by the surveyors, mill men and cruisers were higher than those printed, and in rare cases an underestimate was made. Therefore, all things considered, the figures are very conservative and represent rather the minimum of the forest area than the maximum. The work represents the labor of three months' time. The result shows the immense wealth we have in our forests. At the present valuation of $269,561,329, or 65 cents per 1,000 feet, for the State of Washington, what will our forests be worth when stumpage brings the Minnesota price of $2.87?

"They then give the figures of the forest area of Washington by counties, which amount in the aggregate to 23,588,512 acres. Number of feet standing, 410,333,335,000.

"The estimates are very conservative. Many mill men, loggers and persons who have cruised the timber in various counties, assert that it is entirely too conservative. We have aimed to make the figures rather too low than too high, believing that the above will give as correct an idea as possible of the amount of standing timber in the State that might be termed merchantable. While these figures may seem incredible to persons not accustomed to our timber, our own mill men will readily appreciate our efforts to be fair in these estimates. The Eastern mill man or timber land owner may find it hard to believe that the timber in Chehalis County will average clear through nearly 32,000 feet of merchantable timber per acre, but the writer knows personally of whole townships in that county that will cruise from 6,000,000 to 12,000,000 feet to the quarter section. On one occasion he stood and counted within a radius of about two hundred feet no ess than sixty-four trees, not one of which was less than four feet in diameter, and from two hundred to four hundred feet in height, besides as many more smaller ones that might be termed 'merchantable timber.' The Secretary of the Board of Trade of Anacortes writes that '16,000,000 feet of merchantable timber to the square mile in this county (Skagit) is not a high figure, when it is considered that there are many forty acre tracts that will cut from three to four million feet each.' All of which is perfectly true, as many loggers in that section can testify. A cedar tree from twelve to twenty feet in diameter and from one hundred and fifty to three hundred and fifty feet high, the first limb being nearly or quite one hundred feet from the ground, will cut a considerable number of feet of clear lumber, or quite enough shingles to fill several cars. While of course this is not average timber, it is not difficult to find such enormous trees, when occasion requires, in any of several of the counties of western Washington.

. . . . . .

"It is evident from the above that the heaviest timber is in the counties in the northern portion of Western Washington and in those bordering on the Pacific Ocean. It is a singular fact that might be mentioned in this connection, that the best timber does not grow directly on the coast, but beginning about a mile back from the ocean, it gets larger and better for two or three miles, where it becomes large and fine, this condition prevailing for a number of miles eastward. Again it becomes very large and heavy at the base of the Cascade Mountains, diminishing again as the summit is reached and increasing yet again as the descent is made on the eastern side, until the foothills are reached, where the best timber of eastern Washington is found.

"It has been generally supposed that practically all the timber of Washington was in the western portion, and that perhaps two-thirds or three-fourths of that was in the Puget Sound region proper. It has been generally conceded that there was but little timber of value in any of the eastern counties except possibly Spokane, and that several counties were absolutely treeless. This is a mistake, as will be seen by the above. There are just two counties out of thirty-four in the entire State that are without any standing timber whatever. These are Adams and Franklin, both in the eastern portion of the State, adjoining each other, exactly similar in topography, the two counties comprising an arid sage brush desert, unfit for agricultural purposes without irrigation, and with no means whatever as yet in sight for supplying the deficiency of rainfall, as all streams flow from them, affording no opportunities for easy irrigation.

"The following table will give an idea of the amount of timber, both east and west of the Cascades:

	No. Acres Timber.	No. Feet Standing.
East Washington.....	11,616,720	106,978,041,000
West Washington....	11,974,792	303,355,294,000

"The kinds of timber in the State of Washington are yellow fir, red fir, white fir, cedar, spruce, Alaska pine, larch, yellow pine, bull pine, tamarack, alder, maple, oak, yew, cherry, cottonwood, Alaska cedar, curly maple, birch, madrone, willow, elm.

"The quality of the timber of Washington, taken as a whole, is better than that of any other State.

"Therefore, it is self-evident that Washington is the great lumber yard of the United States from which must come the supply for all parts of the country. In addition to this, China, Japan, Mexico, Australia, South America, and Europe must look to this State for much of their supply, and already the ships of all these countries are in our ports after cargoes. As from all quarters in ancient time did they go to Egypt for grain, so will they now from the four corners of the earth come to Washington for lumber. As did then Egypt prosper and grow rich, so will Washington now, and as did her seaport cities become great, so will those of Washington."

Naphtha for Cleaning Wool.

The employment of naphtha as a cleansing substance in the scouring of wool is a new method favorably commented upon by the scientific papers. By the use of a pump the naphtha is forced through and through the wool, extracting all the natural oil, it being also claimed that the naphtha does not injure the fiber of the wool, as does alkali cleansing, but leaves the fleece in an actually better condition than when cleansed by any other process. A further valuable feature mentioned of this method is that the grease that is extracted from the wool may be again extracted from the naphtha in a pure state, thereby becoming valuable as a medicinal agent or for a saponification into the purest of soaps. A plant following this method is said to have scoured 500,000 pounds of wool, and had saved a product of 80,000 pounds in pure wool oil.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING.—Edward R. Brown, Tallahassee, Fla. This is an automatic coupling employing a bail link and gravity pin, the uncoupling being effected from the top or side of the car. The drawhead is spring-cushioned and arranged to receive a limited vertical rocking movement, the link also rocking slightly in the drawhead chamber, thus facilitating the ready coupling of cars of varying heights. The drawhead and all parts of the coupling are readily disconnected from the car, thus rendering it easy to make repairs.

SWITCH LOCK. — Samuel E. Barlet, Red Bank, N. J. This is an improvement on a patent formerly granted to the same inventor for interlocking railway switch systems, and provides a simple and durable lock which positively prevents the operator in charge of the tower from wrongly setting the switch or signal. The mechanism is so arranged that the operator or leverman cannot manipulate the lock lever and connected mechanisms to display the necessary signal unless the switch is in proper position, as the lock controls the signal.

AIR CUSHIONS FOR CARS.—Linford E. Ruth, Connellsville, Pa. This invention relates to filling mattresses or cushions of sleeping and parlor cars with compressed air without any permanent or organized connection of pipes. It provides for either permanent or detachable cushions with socket-shaped outlets and air reservoirs which can be cut off from the air brake pipes, in combination with a detachable hose having a special form of nozzle at each end fitting in the socket shaped outlets, whereby the cushions may be readily inflated and the hose removed.

Electrical.

SIGNALING.—Douglas L. V. Browne, Denver, Col. For signaling from the moving buckets or cages of mining shafts or from elevator cars, or other apparatus operated by a movable rope, electrical conductors are, according to this invention, concealed within a rope or cable, the operation of the cable in winding and unwinding not being interfered with, and the conductors being connected with circuit-closing mechanism and electrically-operated signals in such a way that the signals may be instantly operated without regard to the position of the rope or cable. The invention affords a simple and positive means of signaling designed to act surely and always make good electrical contact.

CONDUIT ELECTRIC RAILWAY.—Louis R. and Albert H. Lavalle, Holyoke, Mass. This invention provides a system in which a continuous supply wire is used, and the trolley arranged in a series of blocks supplied therefrom, but out of circuit except when the trolley is in contact with them. A positively working switch automatically cuts in the successive blocks and cuts them out as the trolley progresses. The trolley makes positive contact with the trolley wire and also operates the switches. It is vertically extensible, to adapt itself to the varying load of the car, and is separable longitudinally, so that in case a car jumps the track the trolley parts and no great harm is done.

Mechanical.

SPLIT PULLEY.—Mahlon B. Lorah, Reading, Pa. The rim and web of this pulley are made of wood, and especially adapted for electric motors. It has two pulley sections forming a continuous rim and an apertured web having projecting members at each side on which are clamp devices with clamp portions fitting the bushing. The sections are built up of disks of wood glued together, alternate layers having the grain in the same direction. The pulley may be quickly fixed in position and readily changed to fit different sized shafts.

METALLIC PACKING.—Edward L. Raynsford, Susquehanna, Pa. This packing has an inner sectional ring, each section with a groove having beveled sides in its periphery, there being a tongue at one end and a recess at the other, while in the outer sectional ring each section has lugs projecting from its periphery, there being a tongue at one end and a rabbet at the other. The joints between the sections of the inner and outer rings are made to break joints, forming at all times a secure packing without the use of springs.

TREATING SHEET METAL PLATES.—John D. Grey, Baltimore, Md. For treating iron and steel plates for tin, terne, and galvanized work, instead of the costly process of black annealing, this inventor provides, in combination with the pickling apparatus and cold rolls, a series of racks to support the plates in the pickling and washing baths, carriages to receive the racks, an intermediate drying oven with open ends and tracks on which the carriages run, driven by an endless chain and driving mechanism.

BOLTING CLOTH BRUSH.—Harry K. Mowson and Roswell F. Corey, Scottsville, N. Y. The under side of the bolting cloth, according to this invention, is engaged by a traveling revolving brush, which has a backward and forward movement, the brush being in constant contact with the under side of the cloth, and keeping its meshes perfectly free at all times, so that it will work to the greatest advantage in producing very fine flour.

WINDMILL.—Edward S. Crawford, Milford, Ill. This is a simple and strong machine, designed to run easily, readily thrown into and out of gear, and which may be regulated to run with the utmost smoothness and nicety. The head has a laterally extending hollow spindle on which turns the boss of a wheel having pivoted fans provided with crank shafts connected to their pivots, there being a slide shaft in the hollow spindle and a cross arm on the outer end of the shaft. There is a spring between the arm and the end of the spindle, and a spring connected to the outer end of the shaft is adapted to bear on the outer face of the cross arm, while rods connect the ends of the cross arm to the cranks of the pivoted fans.

Miscellaneous.

MATTE AND SLAG SEPARATING WELL.—John D. Davies, Butte, Montana. This well has two compartments, both preferably lined with firebrick, the larger and higher compartment receiving the molten metal from the furnace, having in its top edge at the rear a notch forming an outlet for the slag, and next to the notch a vertical slot to be closed by a plate held in brackets. In the partition between the compartments is an opening near the bottom to conduct the matte from the larger to the smaller compartment, which has on its top edge a matte discharge notch leading to a suitable spout at a lower level than the slag discharge spout. In the outer end of the smaller compartment is a tap hole opposite the tap hole leading from the larger to the smaller compartment.

DUMPING SCOW.—John Russell, New York City. The hull of this vessel has transverse watertight compartments with inclined outer surfaces adjacent to inclined stern and bow sheathings, longitudinal watertight compartments between the transverse compartments, vertical bulkheads, and over the compartments are airtight tanks held in place by the deck. There is a central well whose bottom is formed of hinged trap doors, readily opened for dumping the garbage or load of the scow, which is not liable to founder in any case, and is designed to carry a greater load and be managed by fewer men than heretofore. The scow may also be employed for transporting lumber, stone, etc.

BICYCLE CASE. — Norman W. Mumford, Jaffery, Fla. To obviate the necessity of taking a wheel into or out of the house, this inventor has devised a cheap and simple case in the form of a closed structure adapted to hold the bicycle upright, readily handled and transported, practically burglar and weather proof, and which may be conveniently locked to a building or fixture. It has an end door and interior parallel guides to receive and guide the wheel, and within the case at the top and sides are straps for securely holding the machine in place.

PEDOMETER. — Anton Reinisch and Lorenz Kratochwil, Vienna, Austria-Hungary. This is a device to be attached to boots or shoes, and adapted to receive an impulse each time the foot is set down, a suitable counting mechanism registering the number of steps made. The device may also be attached to the hoofs of horses or other animals for ascertaining the number of steps made.

BANJO.—William F. Libby, Gorham, Me. In this instrument an improved construction of the frame of the head is provided for, designed to afford increased volume and sweetness of tone, and in the right hand edge of the neck is a longitudinal groove adapted to receive the fifth string, which is carried in engagement with a suitable guide to a key located between the keys receiving the other strings. All of the keys are thus grouped together, and the neck at both sides is free for the passage of the player's hand.

PENHOLDER. — Thomas C. Campbell, New York City. The hollow barrel of this holder has a side opening, a spring tongue holding the pen in the barrel, and a slide connected with the tongue being capable of having one end dropped through the opening to disengage the tongue and pen. The pen is as firmly held as in the ordinary holder, but may be readily freed by the releasing device, which does not in the least interfere with the ordinary use of the holder.

BILL HOLDER.—William J. Whitwood, Wellsville, N. Y. This is a convenient device for retaining folded bills or other papers, permitting any or all of the papers to be readily removed. Combined with a holder plate and clamping piece are bow springs attached to the holder plate, a flexible strip being attached intermediately to the clamping piece and at its ends to the free ends of the springs.

DENTAL BRIDGEWORK.—Bernard B. Bray, Axtell, Texas. This invention provides an improved crown, cap or band for attaching the bridges to the natural teeth, the crown or band having a lug at each side of a split portion, the lugs facing one another and having inclined outer side faces. A pin or screw is adapted to enter the lugs and draw them together, forming substantially a dovetail tenon. The improvement is designed to dispense with the large quantity of gold usually required in this character of work, and make artificial teeth look much more natural.

MOP HOLDER AND WRINGER.—Albert M. Bien, Deer Lodge, Montana. This is a device for use with a mop of any size, to facilitate effectively wringing the mop without placing the hands on it. The mopstick has at its forward end a screw-threaded portion on which travels a head block with a wringing frame having a sliding movement, a locking device of the frame engaging the head block. A mop-holding device secured to the mop stick has diverging loops adapted to receive the forward member of the wringing frame.

NUT SHELLER.—Julien Prade, Waco, Texas. This is a simple machine especially adapted for shelling pecans, and which may be used on other nuts. It has an adjustable holder which adapts itself to various sizes of nuts, the holder having a number of radially yielding plates carrying knives and a plunger with radial blades engaging the plates. The plunger cuts the shell from the nut, and the machine cleans out the holder and knives, so that it works well every time.

WELL BUCKET.—William H. Tilford, Wartrace, Tenn. This bucket is arranged to fill itself automatically when lowered into the well and drawn out, and it may also be conveniently emptied. It has in its bottom a valve seat in which slides a tube open at the lower end and carrying at its upper end a fixed valve adapted to be seated on the upper face of the bucket bottom.

SHEEP SHEARS.—Leonard J. Lohlein, Lusk, Wyoming. These shears have a special form of handle adapted to receive and combine with a series of detachable cutting blades, which are quickly interchangeable. One handle may thus be used with a great number of blades, and the latter are more easily ground, the blades being made in a series of different sizes to

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better adapt them to the condition of the wool on different sheep.

NECK YOKE ATTACHMENT.—Benjamin J. Sykes, Troutville, Pa. Three straps are included in this attachment. A holdback strap extending from the collar to the neck yoke, another strap extending from the neck yoke to the belly band, and a third strap extending from intermediate position on the belly band strap to the upper end of the holdback strap. The improvement is adapted for use with a breast strap or with a collar.

ANAL BOUGIE.—Franklin P. Stukey, Lancaster, Ohio. This is a device for mechanically reducing the inflammation and swelling in the treatment of hemorrhoids.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

THE TELEPHONE SYSTEMS OF THE CONTINENT OF EUROPE. By A. R. Bennett. London and New York: Longmans, Green & Company. 1895. Pp. xiv, 436. 12mo, 169 illustrations. Price $4.50.

A painstaking work which should be in the hands of all who are interested in telephony. It includes statistics of the telephone services in twenty-six countries. It gives such information as the history and present position of the telephone in the various countries, the services rendered to the public, the tariffs, the exchanges, the switching arrangements, the hours of service, subscribers' instruments, payment of workmen and operators. The details of the various telephone systems though brief are of value, as the author was thoroughly acquainted with practical telephony, having served several companies as chief engineer. The statistics regarding the financial position of the various companies and their tariffs are particularly interesting in view of the recent discussion regarding the high telephone rates in the United States. The illustrations consist of views of exchanges and instruments, diagrams of switch boards, cross arms, insulators, etc. Great stress is laid on telephone exchange towers and turrets; most of these supports for wires are ugly, but a notable exception is the handsome dome of iron erected over the central post office at Stuttgart. It is capable of carrying 14,000 wires, the whole surface of the dome being covered with insulators. The effect, though a little startling at first, is on the whole very pleasing.

SCIENTIFIC AMERICAN BUILDING EDITION.

JULY, 1895.—(No. 117.)

TABLE OF CONTENTS.

1. An elegant plate in colors showing a residence at Bridgeport, Conn., recently erected for Christian M. Newman, Esq. Three perspective elevations and floor plans. Cost $5,500 complete. Architect, Mr. Samuel D. P. Williams, Williamsburg, N. Y.
2. A handsome residence at Glenwood, N. Y., recently erected for Wm. R. Innis, Esq. Two perspective elevations and floor plans. An attractive design.
3. A modern cottage of attractive design recently erected at New Rochelle, N. Y. Perspective elevation and floor plans. Estimated cost $3,000. Architect, C. B. J. Snyder, New York City. Design in the American order of architecture.
4. A summer cottage at Great Diamond Island, Me., recently erected for Edward L. Goding, Esq. Two perspective elevations and floor plans. Cost $2,500 complete. A picturesque design. Mr. A. Dorticos, architect.
5. An attractive dwelling at Oakwood, Staten Island, recently erected for Mrs. Margaret Dutche. Cost $3,800 complete. Two perspective elevations and floor plans. Architect, Mr. Herman Fritz, Jr., Passaic, N. J.
6. A Colonial dwelling at Springfield, Mass., erected for Messrs. J. D. and W. H. McKnight, at a cost of $6,000 complete. Two perspective elevations and floor plans. A pleasing design. Architect, Mr. G. Wood Taylor, Boston, Mass.
7. Colonial house recently erected at Groton, Mass., in the style of Longfellow's home. Perspective elevation and floor plans. Architects, Messrs. Child & De Goll, New York.
8. View of the Hotel Majestic, New York. One of the finest hotels in the world. Architect, Mr. Jacob Rothschild.
9. A cottage in the Colonial style, recently erected for Margaret Deland at Kennebunkport, Me. A picturesque design. Perspective elevation and floor plans. Mr. Henry P. Clark, Boston, Mass., architect.
10. Suggestions in corner decorations.
11. Miscellaneous contents: Hoop poles.—How to drive rats away alive.—Dumbwaiters and elevators, illustrated. — Saws. — Translucent fabric.—Improved spring hinges, illustrated.—Ventilated school wardrobes, illustrated.—Hanger for storm sash and screens, illustrated.—The hygienic refrigerator, illustrated.—Improved door hangers, illustrated.—Improved steam heater, illustrated. — Concrete roofs.—A trackless sliding door hanger, illustrated. —A first class hot water heater, illustrated.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
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Minerals sent for examination should be distinctly marked or labeled.

(6572) L. J. W. writes: 1. I would be pleased to know what is the cost of a horse power, and what goes to constitute the cost? This I would require as a general average. Also what price is current in selling steam for horse power in engines at the usual conditions? A. The cost of steam power is very variable. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 429, on the cost of steam power. Prices vary from $1 to $1.50 per annum. 2. What is the relative value of an electrical horse power to boiler horse power? That is, I buy coal and I sell electricity, and I buy coal and sell horse power to an engine. A. The relative value of boiler horse power to electrical horse power varies with the economy of the engine, which varies with the amount of steam required to produce a horse power, say from 30 pounds to 12½ pounds, upon which about 80 per cent will be the electrical output of horse power. 3. What is the greatest amount of water evaporated per one square foot of heating surface in marine practice and under what draught? A. The evaporation in marine boilers varies somewhat, say 2½ to 3½ pounds per square foot of surface. Forced draught may increase the evaporation from 10 to 15 per cent. 4. What is the weight of iron per horse power in the usual run of marine boilers in racing craft and torpedo boats? A. There is a wide difference in the weight of the different types of boilers; as low as 40 pounds and all the way up to 200 pounds per indicated horsepower of the engines is noted. 5. What is the horse power required to generate and make 100 tons of ice per day, evaporating water and pumping it also, with a modern improved plant? A. About 4 horse power more or less according to the nature of the process. 6. Can steam from large condensing engines after going through a grease extractor be used for making ice? A. No. 7. Are there any boilers in America being built and run with water tube exactly vertical and short for large horse power? A. None. 8. Is a water tube grate bar successful and economical? A. Not successful heretofore. 9. How many electric horse power can a 100 horse power engine develop? A. About 80 per cent of the indicated horse power of engine.

(6573) P. C. C. writes: Suppose there is a double railroad track where all the trains uniformly travel on one track going north, while the trains all uniformly travel on the other track going south. In such cases it has been observed by experienced railroad men that on the track where the trains travel north, one of the rails (east or west) is always worn more than the other; while on the track where the train moves south, the opposite rail (east or west) is uniformly worn more than the other. In each case which rail is it that wears more (inside or outside) and why? A. North and south railway tracks in northern and mid latitudes are radial to the earth's axis, as shown by the meridian lines on a polar map or globe. As cars move to the south at great speed they meet an increasing speed of the earth's surface, which forces the track against the west side of the train and wears the west rail. When running north the train is constantly meeting a decreased speed of the earth's surface, and having left and partaken of the higher speed of the earth's surface at the south, are thrown against the eastern rail, causing wear. 2. Is it safe for a lightning rod to come in contact with any part (especially those parts exposed to the weather) of a wooden building? A. It is safer to attach a lightning rod to the building than to use insulators, provided the ground connection is perfect or in thorough connection with moist earth. 3. Can a cheap battery be made without using either of the following: Zinc, copper, bluestone (cupri sulphate), carbon, and bichromate of potash? If so, how can I make it? A. There is no reliable battery made with cheaper material than you have stated.

(6574) A. S. De V. writes: Would you kindly inform a number of readers the theory of a cannon exploding while ramming home the load after it has once been shot. Also why holding the touch hole shut prevents an explosion, and also why the same is not necessary when loading a large pistol or muzzle-loading shot gun? A. Muzzle-loading cannon are loaded by pushing a powder cartridge or bag of powder to the breech, followed by the wad and ball. The bag, usually of flannel, is fired by the intense heat of the discharge and its rear end left in the gun. If air is allowed to reach any fragments of the bag that may not have been removed by swabbing, they may take fire and ignite the next cartridge. By closing the vent instantly after a discharge, air is prevented from entering the gun and the act of swabbing does not displace the product of combustion, mostly carbonic acid gas, which is a destroyer of combustion. The swab acting as a churn in the gas does not draw air in to set fire to any heated particles of combustible that might remain in the gun. In muzzle-loading shot guns and pistols the powder is poured in loose and is consumed and blown out at each discharge, so that there is nothing but the powder that could possibly remain, and the possibility of anything in the gun or pistol that would ignite a fresh charge is very small, yet premature explosions occasionally occur in quick firing of muzzle-loading arms.

(6575) W. T. B. writes: I am running a so-called 25 horse power engine, cylinder 10 inches diameter and 12 inches stroke, from a boiler of rated 15 horse power, 60 to 80 pounds pressure, nominal speed 150 revolutions per minute. I do not think that it uses steam economically. Would I get better results or more power by putting on a larger drum (present one is 36 inches diameter) and reducing speed to 120 or 100 revolutions per minute? A. The drum appears to be large enough. There is no economy in reducing the speed of the engine. The boiler appears to be too small for the economical generation of steam for the apparent power from the engine, and you may be wasting heat by the chimney from an overstrong fire and small boiler capacity. The throttle valve and cut-off plays an important part in the economy of running an engine. To be economical requires as full pressure at the steam chest as possible and the valve set to cut off at a point to give the power required. The governor should govern the speed, and the throttle valve should only be used as a contingent to over-pressure or extreme release of load. Without further facts as to the cut-off, kind and amount of work and the kind of boiler, we can only suggest that a larger and horizontal boiler be used, and an automatic governor operating the slide valve be adopted.

(6576) W. S. asks: 1. What size plate and how many of them would I have to use in a 60 cell storage battery to light three 110 volt 16 candle power lamps? The cells built like the Faure battery described in your June 21, 1881, issue. A. For the best results the plates should not be less than 7×10 inches, 13 or 15 plates per cell. To secure the 110 volts, the battery having two volts per cell, you will need $\frac{110}{2}$=55 cells for 1 lamp or any number up to the capacity of the battery. 2. Is the induced current in a transformer, using an alternating current in the primary, an alternating or direct current? A. Alternating current. 3. I cannot understand how Tesla produces a current alternating 100,000 times a second by the multipolar generator described in the "Life and Works of Tesla." Please explain. A. We cannot give a detailed description of Tesla's experiments. It is conceivable that 100,000 alternations per second could be secured by properly proportioning the number of elements in the machine and the number of revolutions.

(6577) M. McG. says: I see in your SUPPLEMENT, No. 397, August 11, 1883, on the subject of military ballooning, that a very light hydrogen gas was produced by passing steam over red hot iron, but it does not explain just how they did it. Can you give me the information? A. See the SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 828, 849.

(6578) C. R. W. asks how the bottoms of trousers are cemented. A. Use thin sheet gutta percha, which can be purchased of the manufacturers especially for tailors' use. Place a piece of the tissue between the layers of cloth to be cemented and press with a hot iron. This causes the cloth to firmly adhere on account of the melting of the gutta percha.

(6579) H. A. McE. says: Can you give me some information regarding the beverage "perry"? A. A fermented liquid, prepared from pears in the same way as cider is from apples. The reduced pulp must not be allowed to remain long without being pressed. In the cask, perry does not bear changes of temperature so well as cider. It is therefore advisable, if at the end of the succeeding summer it be in sound condition, to bottle it, when it will keep perfectly well. The red, rough tasted sorts of pears are principally used for making perry. They should be quite ripe, without, however, approaching to mellowness or decay. The best perry contains about 9 percent of absolute alcohol; ordinary perry from 5 per cent to 7 per cent. Perry is a very pleasant tasted and wholesome liquid. When bottled champagne fashion, it is said to frequently pass for champagne without the fraud being suspected.

(6580) A. D. asks how to make buff wheels. A. Turn up the wooden disk to form the wheel on the mandrel on which it is to run. Cover the periphery of the wheel with good glue, prepared as for gluing wood, stretch the leather around and confine it with shoe pegs driven in about 2 inches apart. When dry turn off true with a sharp chisel. Give the leather a coat of glue and roll it in the emery, so as to make it retain it by being embedded in the glue. Let the wheel dry until the glue is hard and it is ready for use.

(6581) W. P. P. asks for a formula for carton pierre ornaments. A. The following is a formula for such a composition: Glue, previously dissolved in water, 13 parts; pulverized litharge, 4 parts; white lead, 8 parts; plaster of Paris, 1 part; very fine sawdust, 10 parts. Oil the moulds in which it is cast to prevent adhesion.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

July 9, 1895,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Alarm. See Bilge water alarm. Burglar alarm.
Alarm gage, electric, W. H. Bradt ... 542,406
Alarm lock, J. W. Kohn ... 542,479
Alkaline sulphates from bisulphates, making neutral, E. A. Starke ... 542,429
Animal shears, W. Silver ... 542,380
Animal trap, automatic, J. B. Hobby ... 542,610
Arc light support, B. Pickering ... 542,279
Axle, C. J. Killian ... 542,264
Axle, vehicle, Curl & Cummins ... 542,607
Backwater and sewer gas trap, P. F. Lenhart ... 542,417
Bag. See Mail bag.
Baling press, J. M. Sanders ... 542,314
Bath apparatus, electric, W. E. Golden ... 542,471
Battery. See Electric battery.
Bearing, adjustable, M. Young ... 542,580
Bed, table, stretcher, and chair, combined, J. F. & K. M. Sauerbier ... 542,374
Beer drawing apparatus, A. Kopp ... 542,264
Belt, H. J. Gaisman ... 542,306
Bevel, inside, S. H. Markham ... 542,367
Beveling machine, Schraubstadter, Jr., & Schilling ... 542,504
Bicycle attachment, G. E. Heaton ... 542,254
Bicycle bearing, T. F. La Belle ... 542,526
Bicycle clutch mechanism, G. S. Manson ... 542,392
Bicycle locking device, H. C. Tafel ... 542,507
Bilge water alarm, E. Brush ... 542,301
Bit stock, H. V. Smith ... 542,448
Blower for grates or stoves, curtain, W. H. Burden ... 542,302
Board. See Modeling board.
Boat. See Collapsible boat.
Boiler. See Hot water circulating boiler. Sectional boiler.
Boiler furnace, G. Playford ... 542,493
Bookcase, P. J. Pauly, Sr ... 542,277
Book holder, F. A. Taylor ... 542,293
Book, manifolding blank, W. F. English ... 542,467
Boom hitch and loop swing, J. C. Sattes ... 542,503
Bottle safety case, B. S. Atwood ... 542,356
Bracket. See Scaffold bracket.
Bracket, C. Pettit ... 542,535
Brake. See Electric brake. Wagon brake.
Brake shoe, J. J. Kinzer, Jr ... 542,414
Bread knife, L. D. Ball ... 542,583
Bridge flooring, decking, roofing, etc., J. V. Boyd-Wilson ... 542,325
Bridle blinder, W. Kiel ... 542,263
Budding tool, Knowlton & Warehime ... 542,478
Buildings, gable ornament for, J. S. Burton ... 542,517
Bung attachment for barrels, F. Scheler ... 542,316
Burglar alarm, N. P. Chaffee ... 542,407
Burning petroleum, J. J. Looney ... 542,590
Butter making apparatus, F. W. Church ... 542,465
Cable grip, E. Nelson ... 542,489
Calendar, G. W. Sbirk ... 542,538
Camera. See Roll holder camera.
Camp chair, spring back folding, T. D. Reilly ... 542,395
Can crimping machine, J. Gould, Jr ... 542,441
Can labeling machine, H. Albert ... 542,433
Car coupling, P. Brown ... 542,287
Car coupling, P. C. Brown ... 542,603
Car coupling, H. H. Burden ... 542,437
Car coupling, R. Dinsmore ... 542,608
Car coupling, V. Pfaff ... 542,597
Car coupling, Potts & Daniel ... 542,495
Car coupling, A. B. Stubbins ... 542,291
Car coupling, H. M. Whittington ... 542,299
Car fender, R. C. De Vault ... 542,242
Car fender, J. Leighthan ... 542,480, 542,481
Car fender, D. O'Mahony ... 542,276
Car guard or fender, H. Burden ... 542,303
Car loading mechanism, O. A. Thayer et al ... 542,381
Car seat, J. S. Johnston ... 542,411
Car seat, Stymus, Jr., & Kreutzberg ... 542,398
Car track, apparatus for removing obstructions from, F. Shuman ... 542,589
Car wheel, railway, J. Prints ... 542,310
Cars, mounting for mining or similar, J. W. McGill ... 542,345
Cars, rotary fender for railway, J. H. Shoenberger ... 542,573
Carding engine, revolving flat, C. Butterworth ... 542,383
Carding engines, stand for grinding rolls of, C. Mills ... 542,270
Carding or similar machines, metallic toothed cylinder for, Clay & Knowles ... 542,605
Cartridge or other cases, machine for filling, T. C. Batchelor ... 542,322
Case. See Bookcase. Bottle safety case. Show case.
Ceiling, metallic, V. Moeslein ... 542,569
Celluloid articles and manufacturing same, Thurber & Schaefer ... 542,452
Chain, drive, J. H. Mitchell ... 542,486
Chair. See Camp chair.
Cigar tip cutter, G. H. Rodgers ... 542,502
Cigarette and cheroot machine, J. H. Dunn ... 542,615
Clamp. See Ring clamp.
Clothes drier, J. Drum ... 542,556
Clothes drier, J. Everett ... 542,245
Coal elevating apparatus, G. Hales ... 542,558
Cock and warning signal, combination angle, W. R. Bedell ... 542,404
Cock, basin, J. H. Glauber ... 542,251
Coffin lowering attachment, permanent, J. S. Flagg ... 542,361
Coin delivery apparatus, E. J. Brandt ... 542,328, 542,329, 542,602
Collapsible boat, R. K. Laraway ... 542,340
Coloring matter from logwood, making, P. T. Austen ... 542,403
Copying machine, rotary, G. Rehfuss et al ... 542,497
Cornice, window shade, D. Boyer ... 542,515
Corrugating and cutting tool, J. Blumer ... 542,435
Coupling. See Car coupling. Thill coupling.
Cultivator, A. M. Jones ... 542,339
Cultivator, lever, W. S. Lawrence ... 542,614
Culvert or bridge, J. W. Ogle ... 542,531
Curling iron shield, J. C. Earnshaw ... 542,243
Cutter. See Cigar tip cutter. Paper cutter. Welt trimmer.
Cycle saddle, J. P. Johnston ... 542,613
Denture, artificial, E. P. Brown ... 542,436
Detergent compound, L. H. Hutchinson ... 542,524
Digger. See Potato digger.
Dish cleaner, G. S. Blakeslee ... 542,460
Dish cleaner, L. A. Sunderland ... 542,430
Disinfecting apparatus, Scott & Bradshaw ... 542,376
Display stand, P. Ganzhorn ... 542,362
Door hanger, W. J. Arndt ... 542,457
Draught equalizer, G. W. Raymond ... 542,599
Draughting instrument, tailor's, J. S. Hand ... 542,443
Drier. See Clothes drier.
Drill. See Rock drill.
Drinking cup holder, H. M. Evans ... 542,468
Electric battery and application thereof to medicinal purposes, S. R. Beckwith ... 542,459
Electric brake, W. B. Potter ... 542,309
Electric lighting system and dynamo therefor, M. Moskowitz ... 542,487
Electric meter, F. P. Cox ... 542,240
Electrically controlled motor, G. L. Thomas ... 542,543
Elevator. See Grain elevator.
Elevator cut-out valve attachment, A. J. McNicoll ... 542,421
Elevator safety gate, C. F. Peelle ... 542,348
Engine. See Carding engine. Rotary engine. Steam engine.
Engine, F. C. Rinsche ... 542,498
Engine attachment, F. C. Rinsche ... 542,499
Envelope machine, H. D. & D. W. Swift ... 542,353 to 542,355
Excavating machine, C. R. Scoles ... 542,375
Extractor. See Seed extractor.
Feedwater heater and purifier, T. J. Cookson ... 542,831
Fence and method of planking, lattice hedge, W. Young ... 542,600
Fence picket fastener, J. Caylor ... 542,585
Fence post, J. Cramer ... 542,241

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Fence wire fastener, V. F. Mount 542,370
Fender. See Car fender.
File, J. Lehrbeuter 542,266
Filtering saccharine juices, process of and apparatus for, E. Sie & Schmidt 542,586
Finger ring enlarging or reducing apparatus, A. G. & G. V. Pinfold 542,350
Firearms, pneumatic firing device for, I. H. Simpson 542,540
Fire extinguishing chemicals, sheet metal receptacle for, E. F. O'Toole 542,491
Fish hook wrapper, G. F. Mills 542,394
Flower stand, revolving, A. C. Nielsen 542,346
Fluid compression, means for elastic, F. M. Rites 542,425
Fluid compressor, high speed, F. M. Rites 542,426
Fodder binder, W. W. & J. H. Graham 542,363
Frame. See Metal frame. Portable frame.
Funnel, E. N. Gaudron 542,248
Furnace. See Boiler furnace. Smoke consuming furnace. Smokeless furnace.
Furnaces, feeding shavings to, T. W. Jenkins 542,477
Gage. See Alarm gage.
Garment fastening device, O. L. Cady 542,239
Gas, apparatus for manufacture of oil, F. Mayer 542,269
Gas, apparatus for manufacture of water, T. S. C. Lowe 542,566
Gas burners, thermostatic regulator for, J. D. Bowman 542,234
Gas, process of and apparatus for making, T. L. Willson 542,320
Gasket, J. Vallat 542,431
Gate. See Elevator safety gate.
Gate D. A. Peck 542,347
Girder, plate, H. H. Rousseau 542,283
Glass, flattening stone for flattening plate, Chance & Scott 542,552
Grain elevator, W. W. Lockwood 542,418
Grinding device, knife, J. H. La Fave 542,388
Grooves, cutting tool for dovetail, P. McCourt 542,344
Guns, rebound and ejecting mechanism for breakdown, G. D. Potter 542,491
Hame fastener, J. W. Stanley 542,288
Harness plume holder, W. Rauschenberger 542,496
Harp, J. C. St. John 542,576
Harrow, E. W. Freiburghouse 542,470
Harrow, rotary, J. G. Ferrill 542,587
Hasp lock, A. Cashin 542,518
Head gate operating mechanism, F. C. Brown 542,238
Heater. See Feedwater heater. Milk heater.
Helmet, metallic, J. P. Lind 542,389
Hinge, A. H. Gilman 542,250
Hitching strap, I. Von Risch 542,500
Hoisting mechanism, B. L. Toquet 542,545
Hook. See Shoe hook.
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Hoop flaring machine, M. H. Ritzwoller 542,572
Horse whipping device, H. J. Case 542,463
Horseshoe calk bending device, M. Roche 542,396
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Jack. See Lifting jack.
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Knife. See Bread knife. Paring and slicing knife.
Knife handle, T. E. Miller 542,568
Knitting machine, E. E. Randall 542,311
Lace fastener, shoe, C. Wilde 542,432
Lacing stud setting machine, T. A. Perrins 542,492
Ladder, combined step and extension, J. B. McSherer 542,308
Lamp, W. J. Smart 542,286, 542,287
Lamp, arc, A. C. Seibold 542,505
Lamp burner, T. Skinner 542,506
Lamp, electric arc, F. M. Hildebrandt et al 542,589
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Leather coloring and polishing machine, Enos & Pratt 542,439
Lifting dog, F. Beattie ..... 542,230 to 542,232
Lifting dog for cranes, F. Beattie 542,229
Lifting jack, H. Holahan 542,258
Line reel, C. A. Koerner 542,564
Lock. See Alarm lock. Hasp lock. Sash lock. Vehicle seat lock.
Lock, A. V. Jewett 542,563
Locks, electroprotective system for, M. Martin 542,268
Loom shuttle motion, W. F. Kintzing 542,525
Looms, batten for narrow ware, A. Ineinger 542,386
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Musical instrument, stringed, Owen & Crowell 542,583
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Numbering machine, F. Meisel 542,368
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Pictures projected upon screens by magic lanterns are seen in relief, method by which, J. Anderton 542,321
Pills, coating, D. M. Holbrook 542,611
Pill coating machine, D. M. Holbrook 542,612
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Pipe wrench, L. L. Latter 542,416
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Planing machine, double or sectional, L. T. Pyott 542,598
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Power motor, E. Chaquette 542,359
Power transmission, F. Singre 542,428
Press. See Baling press.
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Printing, preparing metal plates for lithographic, H. L. B. Toobe 542,382
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Thrashing machine, C. F. Goddard, 542,519, 543,520 542,522
Thrashing machine steering mechanism, C. F. Goddard 542,521
Tie. See Sack tie.
Tie plate and rail brace, combined, C. F. Quincy 542,352
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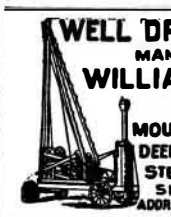

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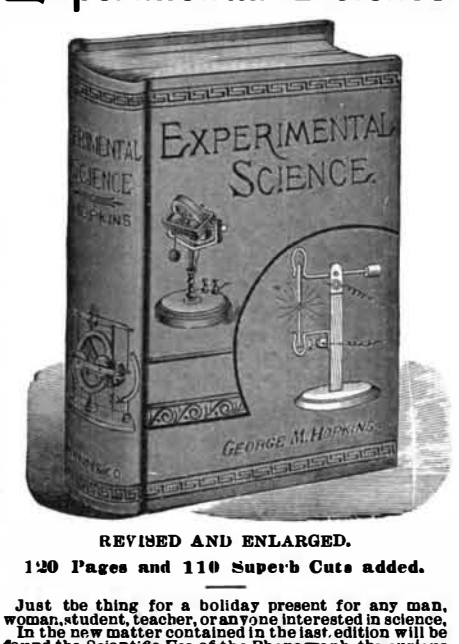

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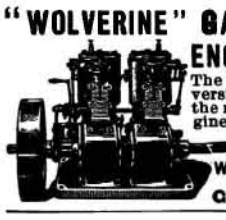

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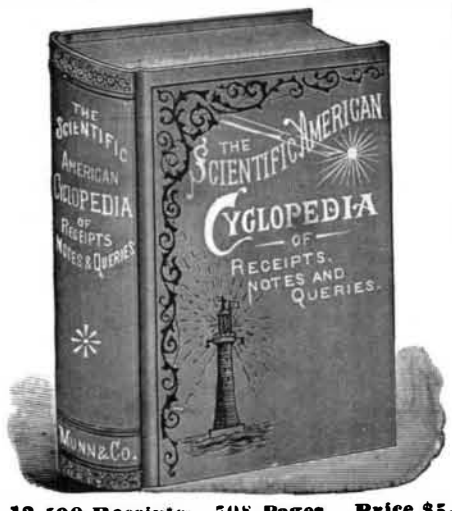

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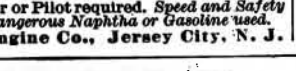

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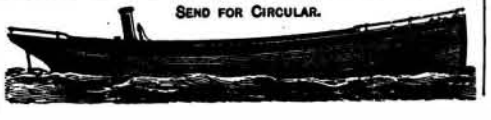

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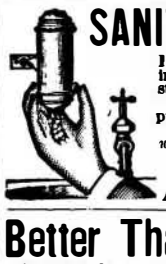

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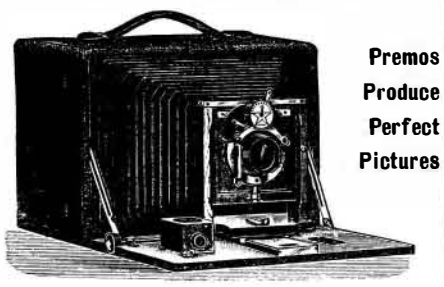

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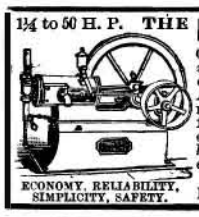

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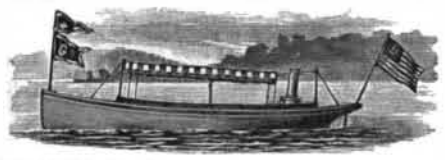

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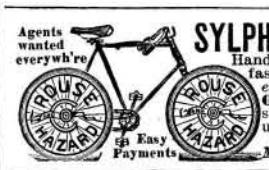

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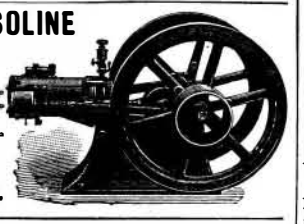

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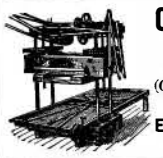

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